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WHEAT-GROWING IN THE NORTH ISLAND.

A STATEMENT AND SOME SUGGESTIONS.

Hon. W. D. S. MacDONALD, Minister of Agriculture.

THE national appeal to farmers to grow more wheat has called forth a gratifying response. From the farmers who have hitherto included a certain amount of wheat-growing as part of their regular cropping the Department has received replies which go to show generally that increased sowings will be the rule this year, while, if the promises made to the Department's field officers are fulfilled, about 40,000 acres will be grown by farmers who have not hitherto grown, or had discontinued growing, wheat. About 12,000 acres of this new wheat land is contributed by the North Island—an area which is not far short of the total acreage in wheat for threshing in the North Island in the 1915–16 season. Yet this marked advance represents no more than 8 per cent. of the total area devoted to grain and pulse growing of all kinds in the North Island, or one-tenth of 1 per cent. of the total cultivated area.

In view of these facts and of the assurance which has been given that every bushel of wheat harvested next season will be of material

advantage to the Dominion and, through it, to the Empire at large, at a time when the resources of food production and transport are being tried to the uttermost, the Government may not unreasonably anticipate that the performance of the North Island farmers in the matter of wheat-growing will be not less, but much greater, than their promise.

That there are disabilities and drawbacks in the way of wheat-growing as a general proposition in the North Island may be admitted. It is, however, for each farmer to consider his conditions, circumstances, and opportunities carefully, and, remembering first the country's need, and secondly his own personal ease or advantage, to decide accordingly. Some of these difficulties are real, some are perhaps imaginary. Let us consider the more prominent.

There is, first of all, the general contention of the unwilling farmer that the North Island is not suitable for wheat-growing. The average threshing yields of wheat in the four land districts — Auckland, Hawke's Bay, Taranaki, and Wellington—for the 1915–16 season (the last period for which complete statistics are available) were respectively 22·97, 25·70, 25·68, and 28·12 bushels per acre. The yields for the past three years at the Central Development Farm, Weraroa, mainly from Purple-straw Tuscan, have been 50 bushels, 30 bushels, and 35 bushels per acre. The 1915–16 season was one of excessive rainfall and humidity during the growing season. The 35 bushels recorded last year were grown on a first furrow turned straight out of lea on 2nd September, the seed being sown on 20th September. The resultant sample was all that could be desired from a milling point of view. Weraroa is less adapted for good grain-production than Rangitikei, Wairarapa, and Hawke's Bay, and not more favourably situated than many other parts of the North Island. The yields on the light land of the Moumahaki Experimental Farm have, with one or two exceptions, been uniformly satisfactory. The following figures are taken from the records :—

Season.	Variety.	Average Yield per Acre.
		Bushels.
1911–12	Marshall's White	50
1912–13	Several varieties	40
1913–14	Solid-straw Tuscan	45·81
	Burgoyne's Fife	39·67
1914–15	Solid-straw Tuscan	70·14
	Burgoyne's Fife	28·75
1915–16	Solid-straw Tuscan	23·25
	Thew	49·66

With the exception of the Solid-straw Tuscan of 1915–16, which blighted to a considerable extent, the quality of the wheat grown at

this farm has been good. The average yield of wheat at the Ruakura Farm of Instruction for the past three years has been 33 bushels.

In brief, the contention that the North Island generally is not suited for wheat-growing is not borne out by the records of recent years. It is, moreover, a well-known fact that excellent crops of wheat were grown in the early days of settlement in those very districts where the cry of unsuitability is chiefly heard.

Less extreme detractors of the North Island wheat-growing campaign adhere to its relative unsuitability as compared with stock-raising and other kinds of cropping. The stock-raising issue will be dealt with presently. With regard to crops, the advantages of maize have been cited. Undoubtedly, better and more reliable yields could be procured from maize than from wheat in some localities, even as far south as the Manawatu, if suitable varieties were grown. Unfortunately, the people of New Zealand have not been educated to the virtues of "corn pone" and "Johnny cake" as items of diet. Nevertheless, if a farmer is satisfied that his conditions are eminently in favour of maize and doubtful for wheat, the country will have no complaint if he grows maize, and plenty of it; this applies especially to Poverty Bay, the Bay of Plenty, and the far North. Not a few farmers have volunteered for potatoes *vice* wheat; this also is acceptable. The main thing is that the man on the land, wherever his holding is situated, should make a special effort to contribute something to the food crops of the country in these extraordinary times. It must be borne in mind, however, that there is little likelihood of a shortage of potatoes; the crop is expensive to raise, and its perishable nature must be considered, while its liability to disease renders it a more speculative crop than wheat. Blue Imperial peas is another crop which is worthy of the attention of farmers who are not prepared to risk wheat.

The main obstacle in the way of a satisfactory extension of the wheat area has been the generally accepted and frequently voiced opinion that wheat can be grown only at great expense, and at a sacrifice of profits from stock. This opinion requires more substantiation than has yet been accorded to it. Consider the other side of the question.

It is not a case of sheep and cattle *versus* wheat, but sheep and cattle *cum* wheat—a combination which is of world-wide adoption, and which satisfies all the laws of good farming. The relatively small proportion of land which would represent a satisfactory effort at wheat-growing in any given case, even if it were completely withdrawn from the use of stock for a year, would scarcely make an appreciable difference on the total stock carried. But land taken in for wheat does not, as a matter of fact, entrench upon the area

available for stock to this extent. Wheat sown before the beginning of September as a rule benefits by being grazed down—the extent to which this is permissible depending on the earliness of sowing, the quality of the land, and the season. Now, except on the richest dairying and fattening country—which it is not suggested should be broken up for wheat—the farms are few which do not include some arable grass land which has become weedy and run out. The winter and early spring grazing afforded by such grass land cannot be supposed to exceed very much the grazing that might be derived from the same land in wheat. So far as the loss of pasture in summer is concerned, there is usually such an abundance of feed for stock in the North Island at this time that this is negligible, while the crops or young grass sown on stubble would enable the succeeding winter's stocking to be increased rather than diminished. If red clover is sown with the wheat, under average seasonal conditions, abundant clover forage will be available for grazing seven or eight months after breaking for wheat. The same object can be achieved by seeding stubble with oats or barley and tares, or with a pasture mixture with oats or barley as a temporary filler. Both practices have been followed at the experimental farms with success.

The mention of laying down the land to grass again recalls us to that much emphasized aspect of wheat-growing — the expense. Granted that when, item by item, the cost of raising the crop at full labour rates for men and teams, interest, depreciation, and all the rest is reckoned up there remains little profit on an average crop—even in this case it would still be merely "playing the game" for a farmer to contribute his share of the harvest in times like these. But should full labour rates be charged to the wheat crop? If some wheat-growing can be done at times when other team-work is slack, is it not so much gain, even if the full labour costs are not reckoned in? What farmer will say that he could not devote the labour required for a few acres of wheat and yet give necessary attention to the staple crops—oats, rape, and turnips—and to his stock? It is a maxim of sound farming not to confine oneself merely to the particular line which pays best, but to include some other project or projects which do not pay so well in the strict accounting sense, so long as they do not conflict with the main business in their demands upon the labour of men and teams throughout the year. Only thus, indeed, can the labour-supply for agriculture be kept in stable equilibrium. Thus to a large extent has wheat been grown in the past.

It is easy to show on paper that dairy-farming does not pay, that wheat-growing would be inviting bankruptcy. Yet there are thousands of prosperous dairy-farmers and no lack of well-to-do

wheat-growers. Undoubtedly, wheat-growing has declined in favour, but only as a purely capitalistic enterprise. The genuine working-farmer growing wheat as part of a mixed-farming proposition has found it profitable enough. The point is that with the conditions brought about by the war the call comes to any and every fit farmer to become a "working" farmer, and to produce what the country requires. And when it is considered that by reason of the smaller amount of preparation required, and the less time involved in growing the crop and getting the land into crops or pasture for stock again, wheat may actually be grown at less expense in parts of the North than in the South, there seems no reason why the North Island farmers should not join their labours in more liberal measure with those of their brethren in the South in this national undertaking.

With regard to the cost of relaying wheat land in grass, it is sufficient to say that there are thousands of acres of arable grass land which have become sod-bound and full of inferior grasses and weeds—land which requires not liming and manuring so much as the revivifying influence of the plough to render active its accumulations of humus, and thus make possible a vastly improved pasturage when it is resown. This necessity for renewing grass land accounts each year for a considerable part of the wheat grown in Canterbury, wheat being a convenient crop to follow on land which has been summer-fallowed for couch-eradication. Certainly a crop of turnips would effect the same result; but why not wheat and turnips too? Turnips are not sown, nor is turnip-ground usually prepared, in August.

What is written above may be regarded as special pleading, or as a general statement of the position with respect to wheat-growing in the North Island which will not be readily controverted. But, however the farmer chooses to view it, his duty is clear: If he has suitable land—neither too rich nor too light, neither inaccessible for a threshing plant nor too far from the railway—and if he can possibly contrive to get the land prepared and the seed sown, he has reposed in him the trust of the Government and people of New Zealand that he will respond to the call to grow wheat according to the measure of his opportunities.

SUGGESTIONS FOR GROWING THE CROP.

One difficulty has not yet been mentioned, and that is the fact that many farmers are willing to "do their bit," but have no experience in growing the crop. Outside of the regular wheat-growing districts information as to the best methods of procedure is not very definite. In view of this difficulty the following suggestions are put forward in the hope that they may prove of service. It may be stated that

these suggestions are based upon a knowledge of the requirements of the wheat crop in relation to prevailing conditions in the North Island, and upon the experiences of the regular growers and of the experimental farms in growing the crop.

Cultivation.

Wheat requires a fine compact seed-bed. If following rape or root crops, plough from 4 in. to 5 in. deep and cultivate to a suitable tilth. The spring-toothed cultivator is the most suitable implement for this purpose; it works the fine soil down and small clods to the surface, where they can be reduced by harrows and roller. Failing a cultivator the disk harrows may be used, but the former gives the best results. On very free land roll both before and after the drill, to consolidate the ground and prevent the seed from being buried too deeply. In these circumstances, and for the same reason, it is often advisable, in sowing, to remove the weights from the coulters of the drill. Medium land may be rolled after drilling, but in the case of strong heavy land it is preferable to postpone this operation until the wheat has attained a height of from 3 in. to 5 in., otherwise the surface is apt to become caked by rains.

When wheat is to follow grass special preparation is necessary. On heavy land skim-ploughing to a depth of about 3 in. should be carried out as soon as practicable; and after a month or more has elapsed the furrows should be well chopped up with the disks, and the land ploughed again to a depth of 4 in. or 5 in. Lighter land may be ploughed once from 4 in. to 5 in. deep, and after remaining in furrow for some weeks it should be worked to a seed-bed. For this work disks and harrows must be used, as the cultivator would only drag undecayed vegetation to the surface. In the drier east-coast districts the double ploughing of lea for wheat in spring is rather a doubtful expedient. If the skim-ploughing cannot be carried through by the end of June the amount of working necessary makes for late sowing, which is not conducive to good results. Probably the best way to deal with lea from July onwards is to graze hard, plough once about 4 in. to 5 in., disk thoroughly, harrow, and roll. Unless the lea is very old and couchy this treatment will answer, although it cannot be expected to give the same results as the standard double-ploughing. On the west coast, on the other hand, this method is in many cases preferable to the double-ploughing, which on good land has a tendency, especially in a dropping season, to result in excessive flag. At the Weraroa Central Development Farm good results, even in the past dry season, have been obtained by turning over lea to a depth of 5 in. in September, double-disking, harrowing twice, drilling the

seed, and harrowing again—the entire operations being carried through practically without a break. Later sowing is, however, permissible on the west coast than in the eastern districts, and accordingly the double-ploughing is still practicable and advisable, except on fertile easily worked land.

Sowing.

Where possible drill the seed. For spring sowing, from 2 to 2½ bushels per acre is recommended. If the seed is machine-dressed less seed is required than with a rough sample. The smaller-grained Australian varieties require less seed than the larger-grained Tuscans. If broad-cast an extra half-bushel of seed is required.

Varieties.

As these notes have reference only to spring sowing, the slow-maturing, free-tillering varieties are excluded. The most suitable wheats generally for North Island conditions are those in which the early-maturing character has been developed. Most of the Australian wheats are of this class, and among them Bobs, John Brown, and Federation are proved varieties in the North Island. Satisfactory seed may perhaps be available from the wheat imported by the Government; as with the exception of a very few wheats—such as Genoa and Correll's No. 7—the bulk of the wheat grown in Australia is early maturing, and likely to give equally satisfactory results with those above mentioned, which have already proved good. It is not expected that lack of acclimatization would materially influence yields, as wheats imported from the far north of Canada have given excellent results on their first season at Weraroa—a change much more extreme than that from Australia to New Zealand.

One of the main difficulties in the way of securing a satisfactory yield of good plump grain in the North Island is the tendency to over-luxuriance of vegetative growth—the crop runs to leaf and straw. This is caused partly by continuous moist conditions during the growing season, and partly by excess of nitrates produced by the rapid nitrification of humus. This latter condition is corrected and a better soil balance maintained under rotational farming, but when land which has been long in grass is cropped with grain this tendency is very marked; it can only be partially remedied by using strong short-strawed varieties and feeding off fairly hard. An excellent wheat for this purpose is Tom Thumb, but it is not suited for spring sowing; it may be replaced on strong rich land in the Wellington Province and parts of Hawke's Bay by Dreadnought. Most of the Tuscans are general-purpose wheats, suitable for spring sowing in most parts of the North Island—Solid-straw and Purple-straw for choice.

Prevention of Smut.

The yield of a crop of wheat is liable to be seriously reduced by the prevalence of the bunt or stinking-smut fungus. Treatment of seed for this fungus is quite effective. The most convenient method is to use commercial formalin at the rate of 1 lb. to 40 or 45 gallons of water; this quantity should suffice for 50 bushels of grain. The solution is sprinkled over the grain, which is kept turned over during the operation until the grain is saturated. The grain is heaped up, covered with bags to retain the fumes for a few hours, and finally spread out to dry. Treated seed should not be kept for more than a week before sowing, as otherwise the germination is apt to be impaired.

Manures.

Generally wheat is benefited by the application of a phosphatic manure. From 1½ cwt. to 2 cwt. per acre of superphosphate, basic superphosphate, superphosphate with 20 per cent. of bonedust included, Ephos phosphate, or any good phosphatic guano will give good results on average land. If the land is poor these quantities may be increased up to 3 cwt. Nitrogenous manures should be avoided.

After-seeding Operations.

When the wheat is from 3 in. to 5 in. high roll with a good heavy roller. If the surface is caked a stroke or two of the tine harrows will be of benefit; in fact, this operation should be seldom omitted. A percentage of young plants are dragged out, but this is much more than compensated for by the increased vigour of the crop as a whole and the stimulus given to stooling. Early spring crops should be eaten down with sheep. It is not advisable to feed off late-sown crops unless they show very rank and forward growth, and generally all feeding should be done by the first week of October. Feeding off causes the wheat to stool out, reduces straw, and delays harvest until good weather can be expected.

CONCLUSION.

A fitting conclusion to these notes is found in words recently uttered by the Right Hon. R. E. Prothero, Minister of Agriculture in Britain, as follows: "I do not believe that the farmers are such a race of people as to want pecuniary inducements. Give them certainty, give them a reasonable profit, and as patriotic citizens they will do their best; and the men who say to the contrary are, I believe, totally ignorant of what is in the minds of the farmers of the country in this great crisis."

NOTE.—An interim statement issued by the Government Statistician since the above article was put into type shows the area of wheat for threshing in the North Island in the 1916–17 season to have been approximately 6,300 acres. This year's rally in wheat-growing by North Island farmers promises, therefore, to be all the more marked.—EDITOR.

DEVELOPMENT OF PEAT SWAMPS.

I. THE WAIKATO AREAS.

RICHARD REYNOLDS, Cambridge.

THE peat swamps of the Waikato district were caused by the original outlets having been blocked up—most probably by Maori eel-weirs—causing the water to overflow back over the flat land that now represents the swamp. The Monavale-Roto-o-rangi Swamp is simply Waikato land covered up. In most places under the peat one finds yellow soil, then sand or gravel—identical with the dry land around Cambridge.

All swamps should be drained under one competent management. The original outlet or outlets should be found and opened up to the source of the water-supply that caused the swamp. This water-supply can be made use of for sluicing out other drains—a method that has been worth hundreds of pounds to the writer in treating a comparatively small acreage.

A peat swamp stands alone as to treatment; it is sour and will take time to sweeten; it cannot be forced beyond a certain degree. The best stock-feed to sow first is Yorkshire fog, *Lotus major*, sweet vernal, and rice-grass (*Microlaena stipoides*); as the land becomes consolidated other better grasses can be grown. Nothing will grow its best until the drains are lowered to the solid bottom or, better still, to the sand or gravel that generally lies a little below the peat in most of the Waikato swamps.

Burn all you can off the surface; get rid of the rush-root fibre as soon as possible. Time must elapse before any peat swamp will grow grass, but let that time be as short as possible by drying and burning off the fibrous top. A peat swamp 25 ft. deep would be better reduced to 10 ft.; there is enough consolidated peat at the bottom that will not burn to retain the accumulation necessary for growing pasture or, by and by, for agricultural purposes.

Some people complain of the peat burning into holes. It would generally be better if all the surface were burnt to the level of the deepest holes; but it is no good burning to any depth in the summer if the burnt level gets full of water in the winter. Drainage must go ahead of burning. Personally, I used to dread burning too deep; now I say, "Let it burn"; you cannot burn a peat

swamp too deep. By this is meant peat pure and simple. As I have said before, there is enough consolidated matter that will not burn. To burn a shallow swamp composed of vegetable mould would, of course, be a calamity to the owner.

Waterlogged peat is sour to the extent of tanning hides. That sourness can be washed out only by deep drainage, so that the rain-water can soak through and run away in the drains. You will notice that for some considerable time the water in a peat swamp will run off in the drains the colour of strong coffee. That colouring-matter must be washed out, for it contains something fatal to grass-growth.

I am quite satisfied now that the Waikato peat swamps could have been made to produce stock-feed in much less time than has already elapsed by having first opened up the original falls to a depth that would take the water down to the solid bottom through the peat. Even if it takes a drain chains wide, let the drain wash itself out, deepening and widening itself to even an ugly form. Dry the land as fast as possible, and burn it as much as possible. My best result has been with the reduction of a 20 ft. depth to 5 ft. I believe that proportion would hold good for any original depth over 10 ft.

Of one thing I am certain: all the Waikato swamps above Huntly can be easily drained. When drained and sweetened they will become most desirable country to occupy. The soil will be friable, porous, and warm, and suitable for all kinds of stock and stock-feed.

In conclusion, I may say that the foregoing observations, although based on long personal experience of the country referred to, are given only as my own opinions.

II. BURNING OF PEATY SWAMPS.

B. C. ASTON, F.I.C., Chemist.

THE reclamation of the peaty swamps of the Waikato is a promising study to which Mr. R. Reynolds, on his Trecarne Estate, near Cambridge, has contributed interesting material. Mr. Reynolds drains by cutting down into the pumice gravel bottom about 10 ft. below the surface. In time the fibrous mass of vegetable remains becomes dry enough to burn in summer without any preliminary treatment other than ploughing with a disk plough, leaving a white ash on the surface, as shown in the accompanying photographs. As soon as the ashes are cool on the surface the following mixture per acre is sown: 4 lb. cocksfoot, 10 lb. rye-grass, 2 lb. to 4 lb. timothy, 1 lb. white clover, 2 lb. red clover, 1 lb. alsike. The land is, if possible, harrowed before

BURNING PEAT LANDS AT "TRECARNE."

GRASSED PEAT LANDS AT "TRECARNE."

Showing good effect of burning on resultant pasture. The dark area has been burnt.

[*Photos by B. C. Aston.*

TABLE I.—ANALYSES OF SWAMP SOILS AT "TRECARNE," NEAR CAMBRIDGE.

Laboratory No.	Total Moisture.	Loss on Ignition.	Total Nitrogen.	Hydrochloric Acid Extract.				Citric Acid Extract.		Percentage of Ash in Soil.	Percentages calculated on Ash of Soils.				Weight of Wet Soil per Cubic Foot.	Remarks.
				Potash (K_2O).	Phosphoric Acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).	Potash (K_2O).	Phosphoric Acid (P_2O_5).		Potash (K_2O).	Phosphoric Acid (P_2O_5).	Lime (CaO).	Magnesia (MgO).		
															lb.	
E 1454 (1)	24·17	21·47	0·518	0·06	0·15	0·14	0·04	0·009	0·015	59·55	0·08	0·20	0·18	0·06	30·5	From "A" paddock. Grey loose friable soil. Depth sampled, 9 in.
(2)	54·94	64·43	1·033	0·09	0·08	0·14	0·06	0·015	0·008	16·03	0·24	0·22	0·40	0·17	24·2	From paddocks 11, 10, and 9. Virgin humus soil. Depth sampled, 9 in.
(3)	53·42	58·24	0·763	0·03	0·04	0·14	0·04	0·008	Trace	19·45	0·07	0·09	0·34	0·09	24·8	From paddocks 11, 10, 9. Manuka scrub, humus subsoil of (2). Depth sampled, 9 in.
(4)	41·00	48·68	1·006	0·08	0·11	0·31	0·07	0·008	0·011	30·28	0·16	0·22	0·61	0·14	21·6	From paddocks 3 and 3A. Humus soil. Depth sampled, 9 in.
(5)	46·56	61·66	0·877	0·05	0·09	0·21	0·05	0·008	0·009	20·49	0·12	0·24	0·55	0·12	24·2	From paddocks 3 and 3A. Humus subsoil of (4). Depth sampled, 9 in.
(6)	53·23	69·13	1·144	0·14	0·09	0·40	0·38	0·093	0·005	14·45	0·47	0·29	1·28	1·20	..	From paddock 8. Humus soil. Depth sampled, 18 in.
G 27	15·03	5·99	0·100	0·18	0·11	0·18	0·22	0·003	0·012	..	..	..	..	..	..	Stiff yellow clay soil.
		Percentages calculated on soil dried at 100° C.														

sowing, but it is otherwise treated like a bush-burn, and no artificial fertilizer is used.

According to Mr. Reynolds there are many timber-stumps buried in the peat, there being two distinct layers of stumps, pointing to great alteration in past times in the level of land suitable for growing forest. The top layer of stumps is near the surface, and the timber is that of the rimu or red-pine, while the lower layer is 4 ft. to 8 ft. below the top layer, and consists of both rimu and what is locally called "yellow-pine," a tree which is used for posts, and is not now found growing in the vinicity.

As one would expect, the effect of this surface burning of the peat is to sweeten the soil greatly and produce a more copious growth of pasture, especially clovers, than any adjoining land not so burnt. This is shown by the very instructive photo taken from the top of the spoil thrown out of one of the big drains. In the foreground is the opposite side of the drain, showing the white pumice spoil. Beyond, on the portion of the paddock which has been burnt the much darker colour defines the area fertilized by merely burning the surface, while the area lighter in colour denotes the portion not burnt and the inferior growth of grasses and clovers compared with the pasture growing on the burnt land.

TABLE II.—ANALYSES OF PEAT ASHES FROM "TRECARNE."

Laboratory No.	Matter insoluble in Hydrochloric Acid.	Alumina, Iron Oxides, &c	Phosphoric Acid (P_2O_5).	Lime (CaO).	Potash (K_2O) soluble in Water.
E 1396 (1)	83·80	7·98	0·67	1·32	0·62
(2)	91·15	3·54	0·34	0·72	0·20
1397 (1)	93·33	5·35	0·26	0·52	0·20
(2)	69·12	21·81	0·41	0·58	0·15
1455	..	..	0·45	0·61	0·28

E 1396 (1)—Ash collected from burning peat swamp.
(2)—Ash collected from burning peat swamp.
1397 (1)—Ash from peat samples.
(2)—Ash from peat samples.
1455—Ash from No. 3, bush swamp.

Referring to the table of analyses of "Trecarne" swamp soils, No. E 1454 (2), from paddocks 9, 10, 11, may be taken as showing what the composition of the land is after draining but before burning. There is only some 16 per cent. of mineral matter in this soil, the remaining 84 per cent. being vegetable matter, which burns away, leaving a new soil on the top, a white ash rich in plant-food. The composition calculated for it is given in the table. Samples of the ashes themselves were also analysed, and the results are given in

Table II. These show the ashes to contain from 0·1 to 0·6 per cent. of potash soluble in water, and phosphoric anhydride from 0·2 to 0·6 per cent. (equivalent to 0·4 to 1·3 per cent. tricalcic phosphate), so that a ton of these ashes would be worth at present prices about 5s. to 10s. per ton for the potash and phosphoric acid alone, and there must be many tons on every acre. There are, of course, other ingredients which are valuable on peaty soils, such as the silica, lime, magnesia, and iron, which all have a useful effect on the sour peat, correcting its acidity and its deficiency in mineral matter.

Chemically there is only one drawback to this burning, and that is the nitrogen which is wasted. When the peat is burnt this is lost; but as there is a great excess of nitrogen in the peat, and much unburnt peat remains, one can pardon the extravagance, especially in the initial treatment. A way of avoiding this waste of combined nitrogen would, of course, be to lime, or marl, or clay heavily. But European writers who speak lightly of applying 100 loads of marl or clay to the acre would not care to follow their own advice in New Zealand.

If, however, merely the superficial layer of fibrous material is destroyed by burning, and not what is called "ripe peat," it appears that the burning of drained swamps is sanctioned by extensive practice in Hanover, Friesland, Lunenburg, Oldenburg, and in Holland, and no one could accuse the farmers of those lands of wasteful methods in agriculture. Moor-burning in northern Europe is generally recognized as a quick method of bringing in what would here be regarded as waste land. By simply draining and burning, the land, which previously produced nothing but rushes, wool-grass, and enormous masses of aquatic mosses on the spongy soil, is converted, without any manure, into green fields of rye and other crops.

The methods employed to burn the upper layer are generally those of "paring" the land at a dry time of the year into sods, which are allowed to dry, being often set on edge to facilitate this, and are finally burnt as they lie, or in little heaps, without any special care being taken to regulate the rate of combustion. The ashes and carbonized matters are spread and harrowed in immediately. Care must be taken to burn at a time when there is water enough in the soil to prevent the fire spreading to too great a depth. The production of a white ash is not necessarily aimed at; the mere charring of the peat is considered to effect great improvement, destroying organic matter of a resinous or waxy nature (bodies soluble in alcohol) and rendering the plant-food present in the vegetable remains much more available (soluble in water), destroying the organic matter soluble in water (the coffee-coloured waters Mr. Reynolds mentions), and reducing the amount of lime needed to

neutralize the acidity. Any temperature above that of boiling water (100° C.) is useful in effecting improvement in the peaty particles. In Holland the seed is sown in the warm ashes and harrowed in with hand-harrows. Some experimenters have urged that the heating of the peaty soils to a moderate temperature is as important as the production of ashes.

The caution must be insisted on that burning is not suitable for shallow peat swamps. Such a case as burning down to the original clay or gravel bottom must be accounted wasteful in the extreme.

One interesting point may be mentioned in connection with the "Trecarne" soils. It will be noticed in the first six samples, which are all from similar peaty paddocks on the same level and contiguous, that one (No. 6) is pre-eminent in the percentage of lime, magnesia, and potash present. When this was pointed out to Mr. Reynolds he exclaimed, "That is my fattening-paddock."

NOTE ON VACCINE TREATMENT FOR CONTAGIOUS ABORTION IN DAIRY COWS.

RESEARCH work in all parts of the world has thrown some new light upon this insidious disease, though there is yet much more to be learned. The methods of treatment recommended by the Department are still the best known, though there are indications that a form of treatment by a vaccine may be elaborated to the extent of proving of value. At present the best that can be said for the treatment is that it appears to be useful as a preventive when applied to empty cows some time before service. The best available up-to-date information has been obtained, and vaccine is being prepared at the Veterinary Laboratory, Wallaceville, with a view to giving the treatment a practical trial under New Zealand dairy-farm conditions. In its present form it is not a treatment which can be satisfactorily applied by farmers themselves, and it is evident that more research and experimental work is necessary before effective and practicable means of coping with the disease, better than those in use of late, can be recommended for general application by dairy-farmers themselves. It may be added that Mr. H. W. Carbury, M.R.C.V.S., at present in charge of the Veterinary Laboratory, has had experience in Ireland in connection with the vaccine mentioned. — *C. J. Reakes, D.V.Sc., M.R.C.V.S., Director, Live-stock Division.*

SAVING OF MEAT-STORAGE AND SHIPPING SPACE.

TREATMENT OF CARCASES.

A SIMPLE but extremely effective expedient for space-saving in connection with frozen mutton and lamb is now being given a trial in New Zealand, and as the method referred to secures a saving of something

MUTTON CARCASE CUT FOR SPACE-SAVING.

Hung by fore legs; cut made immediately behind saddle. (Hind part hung for photographic purposes only.)

approaching 20 per cent. in space the importance of the matter in the present congested state of the frozen-meat stores and shortage of refrigerated shipping needs no emphasis.

THE SPACE SAVING TREATMENT CONTRASTED WITH ORDINARY METHOD.

On left, carcase with hind part packed (shanks uppermost) in fore part; note stitch at bottom. On right, ordinary carcase.

CARCASES IN COOLING-ROOM TREATED BY THE SPACE-SAVING METHOD.

STACK OF THE SEVERED CARCASES IN FREEZING-CHAMBER.

Close tiers formed by stacking carcases on the side, right to left left to right, and back to front.

Briefly, the process consists in dividing the carcase of mutton or lamb in two immediately behind the saddle, and packing the hind piece into the hollow of the fore part. After slaughtering, the carcase is placed in the cooling-room until thoroughly cooled and set, but hung by the fore legs, instead of the hind legs as in the ordinary practice. The cut is then made, and the hind piece is fitted into the fore part sideways, shanks uppermost. The two parts are held together by the insertion of a stitch in the corners of the flank.

The fitting of the two pieces is remarkably close, a very compact package resulting. Taking an average mutton carcase, the length of the hind part cut off is about 1 ft. 8 in. On a 60 lb. carcase the weight of the hind part severed is 20 lb. to 22 lb., this representing the extra weight that can be got into an otherwise empty space.

The space-saving by the new method has been well demonstrated in the loading of insulated railway-wagons. The standard "V B" wagon holds from 420 to 440 ordinary mutton carcases stacked fairly close, whereas by the new method over a hundred additional carcases have been stowed into the same class of wagon. Carcases treated in the manner described also stack closer than ordinary uncut carcases.

A small trial shipment is being made to London this month.

The same principle of space-saving (but differing slightly in detail) is being experimented with at Australian meat-works, where it is reported to have also been applied to beef quarters. In New Zealand experiments are being made with beef, but the matter has not yet reached a definite stage.

The accompanying photographs, which were taken for the *Journal* at the Ngahauranga Freezing-works, by courtesy of the Wellington Meat Export Company, will enable the new method to be clearly understood.

SIZE OF THE JOURNAL.

It will be noticed that this issue of the *Journal* is considerably reduced in size. The reduction has been necessitated by the prevailing shortage of paper, and the usual number of pages cannot be reverted to until the position has improved. Care will be taken, however, to maintain the most useful features of the publication.—EDITOR.

In 1916 the area under wheat in the United Kingdom was 2,053,568 acres, the estimated production 7,471,884 quarters (nearly 30 bushels per acre), and the average price per quarter, 58s. 5d. For barley the corresponding figures were 1,653,376 acres, 6,612,550 quarters, and 53s. 6d.; and for oats 4,171,353 acres, 21,333,782 quarters, and 33s. 5d.

SO-CALLED AUSTRALIAN STRINGHALT OF HORSES.

RECENT OBSERVATIONS IN CANTERBURY.

THE occurrence last year of an exaggerated form of stringhalt among horses, chiefly in Canterbury, was described by Dr. Reakes, Director of the Live-stock Division, in the *Journal* for May, 1916, under the heading of "Notes on a Form of Nerve-derangement in Horses." Further study of the matter has confirmed the veterinary authorities in their opinion that the disease is undoubtedly that termed "Australian stringhalt." Careful observations made, together with the experimental work carried out, clearly indicate that it is not in any degree contagious, but is of dietetic origin, though the causative agent remains undetermined. Except in those acute cases where death occurred soon after the onset of the trouble, recovery came about spontaneously after the lapse of some months, the animals apparently being little or none the worse for their experience. This year has seen some recrudescence of the trouble in Canterbury, but the occurrence has been comparatively slight. A report on the subject has been supplied by Mr. J. Kerrigan, Veterinary Supervisor, Christchurch, as follows:—

Towards the end of February last I learned that one or two suspected cases of Australian stringhalt had appeared in the North Loburn district, and, being very much engaged at the time, communicated with Mr. J. Munro, Inspector of Stock, Amberley, asking him to make inquiries. I mentioned that on account of the summer being very dry, and especially if the season so continued, we might reasonably expect this trouble to appear again among horses in Canterbury. Early in May I visited the Amberley district, and have made the following notes on the occurrence of the trouble and cases that have appeared in this and in other parts of Canterbury.

In a short report received from Inspector Munro regarding this season's cases in his district he states that during the last week of February and in the month of March horses affected with stringhalt appeared here and there over his district, and he was beginning to think that the trouble was going to be more serious this year than last; but during April and May few, if any, reports of new cases came to hand and those that were affected began to recover, and at time

of writing all had practically recovered, except a few cases that were severely affected.

I think it worth noting here that the rainfall in Canterbury was above the average during April this year, and that we had a very heavy fall during May. Our average annual rainfall is about 26 in., and during the past four years it has been as follows: 1913, 26·63 in.; 1914, 20·31 in.; 1915, 15·37 in.; 1916, 22·61 in. It will be noted from this that the total rainfall for the three years 1914, 1915, and 1916 was 58·29 in., which is about 20 in. less than normal for three years. In 1916 we had a good fall during the winter and up to the end of August, but the fall since that up to the end of May of this year has been as follows: September, 1·41 in.; October, 0·66 in.; November, 0·35 in.; December, 0·43 in.; January, 1·68 in.; February, 1·49 in.; March, 1·15 in.; April, 2·42 in.; May, 6·85 in. The appearance of the disease during a period when the rainfall was below normal may be considered an interesting point.

When in the Amberley district during May I visited several places where fresh cases had appeared this year, as follows:—

Farm No. 1.—Two cases: (1.) A two-year-old gelding died about the end of February, a few hours after he was noted to be affected. This animal exhibited roaring symptoms and difficulty in respiration. (2.) Grey gelding, five years old. I saw this animal in a paddock. It exhibited the stringhalt and knuckling-over symptoms in both hind limbs.

Farm No. 2.—At this place I saw two thoroughbred mares slightly affected, and the stableman stated that a third one was also slightly affected. All three showed the first symptoms this year.

Farm No. 3.—The owner stated that a fresh case appeared amongst his horses during February of this year, but it appears that it was not severely affected. Five horses were affected on this farm last year. (See No. 2 of last season's cases, described below.)

Farm No. 4.—Three horses affected this season. They were working when I visited the place, and only two of them showed stringhalt symptoms, and they were not badly affected.

Farm No. 5.—Five cases last year, and one fresh case this year. The animal was turned out in a back paddock when I visited the place, and I understand it was not badly affected.

In Inspector F. Mackenzie's district two cases appeared in the Ashburton neighbourhood, one near Rakaia, and several near Cust, and he states that these have now practically all recovered. Several horses were said to have died in the Cust district as a result of the disease, but Inspector Mackenzie states that from inquiries he made he is confident that they died as the result of other causes. I have also been informed that one or two cases appeared in the Sockburn district.

I have noted that this year the majority of the cases of Australian stringhalt were, in general, of a less severe type than those that occurred last year, also that after the April and May rainfalls they have practically recovered, except a few that were severely affected.

Regarding the cases that occurred last year it is interesting to note the following :—

Farm No. 1.—Several horses died here last year, and two remained affected : (1) Chestnut gelding which was slightly affected now shows no symptoms of the disease ; (2) large bay mare on 8th May still exhibited symptoms of stringhalt when starting and stopping.

Farm No. 2.—I met the owner's men on the road a short distance from his farm with some of the horses in carts. He had five horses affected last year, and four of these have recovered. The fifth horse was in one of the carts, and shows the knuckling-over symptom on the off hind fetlock, and also signs of stringhalt when backed.

Farm No. 3. — Three horses affected last year. One died, one recovered, and one remained very severely affected ; in fact, this animal could hardly move about the paddock. Now, although he still knuckles over badly in the hind limbs and shows signs of stringhalt, he has improved considerably, and moves about fairly freely.

Farm No. 4.—Six thoroughbred horses affected last season, and none this year. One of the six horses died, and the other five have all recovered. One of these five, a mare in foal, was so badly affected that she could only get about with very great difficulty and hit her abdomen with her hind limbs every time she moved a step. Now she shows no signs of the trouble.

Farm No. 5.—Three horses affected last season, and one of these only showed slight symptoms and soon recovered. Regarding the other two, one recovered some time ago, and the other has greatly improved, and just occasionally—especially on cold days—exhibits slight symptoms of stringhalt.

Farm No. 6.—One horse badly affected last season. At the time of my last visit (8th May) it had almost recovered, and only occasionally showed slight stringhalt symptoms.

Farm No. 7.—Five horses affected last year. Four of these have practically recovered, and the fifth one, which was badly affected, has greatly improved ; it was ploughing when I saw it and showed only slight symptoms of stringhalt. One horse affected this year, but, I understand, not badly.

Farm No. 8.—Two light horses and a half-draught horse affected last year. These have all recovered. One of these horses, a prize-winner at the jumping competitions in shows, was at one or more shows last season and secured prizes, as by that time (November, 1916) it had thoroughly recovered.

Farm No. 9.—I understand from Mr. Barry, Veterinarian, that the horse that knuckled over badly recovered some time ago, and that the one which exhibited marked stringhalt symptoms (see photograph in *Journal*, May, 1916) has greatly improved.

Farm No. 10.—Two horses affected last year—a young draught horse, which exhibited knuckling-over and stumbling, and a light milk-cart animal, which showed stringhalt (illustrated in same *Journal*). Mr. Barry informs me that these have both recovered.

All the horses which I saw affected with this disease, except where otherwise stated, were draught horses.

It has been noted by several owners of affected horses that the symptoms are more pronounced during very cold weather. Two owners have mentioned to me that horses that were badly affected, and have wholly or partially recovered, have occasionally exhibited symptoms indicating that "they were not altogether right in their head."

SPRAY-TESTING AT ARATAKI.

SUMMER CONTROL OF WOOLLY APHIS.

T. E. RODDA, Manager, Arataki Horticultural Station.

AN experiment in the control of woolly aphis was conducted at the Arataki Horticultural Station during the past summer, being one of a series of tests of spraying-compounds arranged by the Horticultural Division in co-operation with a committee of the Hawke's Bay Fruit-growers' Association.

The compounds used were the tobacco preparation "Black Leaf 40," at a strength of 1 part to 800 parts of water, plus 2 lb. soft-soap, on six rows of trees; "Black Leaf 40," 1-800, plus 2 lb. soft-soap and 3 lb. Swift's arsenate of lead per 100 gallons of water, on four rows; and resin-soda, 5-5-40, on four rows. The object of adding the arsenate was to ascertain if the combination would scorch the foliage. Many of the growers round the district seem to have had the impression that it would scorch. The experiment was set out as follows:—

No. 1.—Two rows sprayed with "Black Leaf 40"; strength, 1-800.
No. 2.—Two rows sprayed with "Black Leaf 40"; strength, 1-800, plus arsenate.
No. 3.—Two rows sprayed with resin-soda; strength, 5-5-40.
No. 4.—Two rows sprayed with "Black Leaf 40"; strength, 1-800.
No. 5.—Two rows sprayed with "Black Leaf 40"; strength, 1-800, plus arsenate.
No. 6.—Two rows sprayed with resin-soda; strength, 5-5-40.
No. 7.—Two rows sprayed with "Black Leaf 40"; strength, 1-800.

The remainder of the orchard was sprayed with resin-soda.

All trees in the test rows that showed signs of woolly aphis were sprayed on 15th and 16th March, and the rest of the orchard on 19th

March. A pressure of 250 lb. per square inch was maintained throughout the operation.

The trees were examined by Mr. Esam, district Orchard Instructor, and myself for report on 6th April, the results being recorded as follows:—

No. 1.—A little live aphis showing on young grafted trees that were only slightly infected at time of spraying. Trees that were badly infected at time of spraying now showing no trace of live aphis. No injury to foliage.

No. 2.—A little aphis showing on two trees. No injury to foliage.

No. 3.—A good deal of scorching of foliage, especially tips of grafted trees. A fair amount of live aphis showing.

No. 4.—A fair amount of aphis showing. Trees in these two rows were not so bad at time of spraying. Aphis has increased on portions imperfectly sprayed. No scorching of foliage.

No. 5.—No scorching of foliage. Two trees of Allington Pippin that were extremely bad at time of spraying now showing no signs of live aphis. Two trees of Esopus Spitzenburg that were exceedingly bad previous to spraying now practically clean, except in some of the large knots on the inner portion of the branches.

No. 6.—A large amount of aphis showing. Only where a direct hit has been registered by the spray has the aphis been killed. A great amount of scorching. On many trees fully one-quarter of the foliage fallen. The scorching was most pronounced on the lower portions of the trees, where the majority of the spray had been directed to wash off the aphis.

No. 7.—No scorching of foliage. Aphis showing on a few trees. Trees badly infected at time of spraying now practically free of live aphis.

In the rest of the orchard, sprayed with the resin-soda compound, the foliage was more or less scorched throughout. The aphis was killed wherever the spray had touched it with any force, but in places where the compound failed to reach with any force the aphis was very active.

It was observed throughout the tests with "Black Leaf 40" that the fluid appears to have a greater penetrating power than resin-soda. This may probably be accounted for by the addition to the former of soft-soap, which has a tendency to make the spray adhere to the woolly coating of the aphis, and when influenced by the sun creates a greater penetrating effect, spreading the nicotine so that it will reach a larger number of aphides.

Resin-soda is the cheaper mixture of the two, but takes a fair amount of time to prepare. The cost of the two mixtures per 100 gallons was as follows: "Black Leaf 40," 16s.; resin-soda, 7s. 3½d.

THE MAKERUA AND MOUTOA FLAX AREAS

IN RELATION TO LARVAL ATTACK.

D. MILLER, Entomologist.

THE Makerua and Moutoa flax areas in the Manawatu district, which consist of about 19,000 acres, are the largest in New Zealand and of outstanding importance in the flax-milling industry, there being forty-one strippers at work in the Makerua alone. An understanding of the topography and physical conditions of these swamps is therefore of considerable value in studying the matter of control of the pests and diseases of phormium described by the writer in last month's *Journal*, to which article these notes are supplementary.

The areas in question form an elongate tract of country lying in a north-easterly and south-westerly direction in the vicinity of the Manawatu River, extending from Linton in the north to near the coast at Foxton in the south. The Makerua is separated from the Moutoa by the river, the latter area being bounded on all sides, except on the north, by a large bend of the Manawatu.

The Makerua Swamp (about 14,000 acres) is, roughly, triangular in shape, with its apex at Linton, being bounded on the west and south (base) by the river and on the east by the foothills of the Tararua Mountains.

From Linton to the south-west corner of the Makerua the Manawatu River flows between well-defined and, in places, very deep banks, but along the southern side—*i.e.*, between the Makerua and the Moutoa the banks gradually become less defined, until around the greater part of the Moutoa they are very shallow. This lower portion is affected by the tides, and in consequence of this and the shallow banks the river more readily floods the Moutoa and the south side of the Makerua. In these localities the land contains a much greater percentage of moisture than farther up the river. This point was demonstrated during the drought of last summer when the pasturage of the Moutoa locality was compared with the dried-up areas of surrounding districts.

The Makerua Swamp lies in a decided hollow, the river-banks being well above the level of the area; this is particularly prominent along the western and, to a less extent, the southern sides. On the

other hand, this is not at all a marked feature of the Moutoa, where the river is more or less tidal and certainly more sluggish. In the Makerua along the river-banks and across the north side of the Moutoa are several lagoons which are either wholly or partially dry during the summer.

Both these areas have been well drained—more particularly the Makerua. In the Moutoa a large channel has been cut, into which the smaller drains lead; this channel is usually full of slowly flowing water. On the other hand, the Makerua is drained by two main longitudinal channels and the Tokomaru Stream, all of which join the river along the south side of the swamp. This swamp, particularly

FIG. I. SHOWING RELATION OF MAKERUA AND MOUTOA SWAMPS TO MANAWATU RIVER, ETC.

the northern half, has been overdrained.* Though there is a good growth of flax, the conditions, owing to the comparative dryness from draining, are exceptionally favourable for the propagation of the larvæ attacking the flax. In these overdrained areas apparently more leaf-tubes form than where there is a moderate amount of moisture. If moisture affects the age of the leaf the advantage of not having the swamps overdry would be twofold; there would be

* Recent investigations have shown that the larvæ of the flax-grub winter in the soil, and this fact demonstrates the possibility that winter flooding will prove an effective method of control. The ground should be flooded just prior to the pupation of the larvæ, and studies are being carried out to determine the minimum saturation of soil necessary to kill the larvæ.

more leaf at time of cutting, and less larval attack owing to the lack of leaf-tube shelters. In moister localities, such as the Moutoa and those gullies along the east side of the Makerua, fewer leaf-tubes appear, and larval attacks cause no appreciable damage.

The soil of the Makerua is composed of peat, becoming shallower toward the foothills on the east and deeper as the swamp falls to the centre. From the river on the west to the centre of the swamp, and for about half a mile from the river on the south, the peat is covered by silt from the floods. This deposit gradually thins out towards the centre of this area, when the peat appears as the surface rises to the east.

FIG. 2. RIGHT BANK OF MANAWATU RIVER JUST BELOW LINTON.

The Makerua is flooded on the west and south by the Manawatu River, and on the east, south of Tokomaru, by the Tokomaru Stream. The flora varies in its nature. Roughly speaking, north of Tokomaru—which is drier than to the south—the bush areas are mostly composed of pukatea (*Laurelia novae-zealandiae*), and amongst the flax a considerable growth of nigger-heads (*Carex secta*), while south of this kahikatea (*Podocarpus dacrydioides*) and raupo (*Typha angustifolia*) are in evidence. In the moister bush areas is a dense undergrowth of *Coprosma*, and throughout the swamp cabbage-trees (*Cordyline australis*) are a prominent feature.

Formerly along the river and east side was a more or less complete circle of bush, but this in most places has been destroyed and the country grassed, only a few isolated clumps of bush remaining.

The birds most abundant in the Makerua are starlings, thrushes, blackbirds, and yellowhammers. These keep mostly to the bush areas and along the margins of the flax area. Formerly pukekos and bush-hens were common, but they have been practically exterminated; occasionally pukekos are found in the vicinity of the lagoons along the river-bank.

The following brief sketch of the history of the Makerua as a flax-milling area has been supplied by Mr. A. Seifert :—

Originally the Makerua Swamp was more or less a morass, there being very little flax except along the elevated river-banks and here and there upon nigger-heads or similar elevated positions. Since then, however, the swamp has been heavily drained, so that now it is comparatively dry and carries a dense growth of flax. Before 1902 a

FIG. 3. MANAWATU RIVER BETWEEN SHANNON AND FOXTON.
Note lowness of banks as compared with Fig. 2.

portion of this area was drained in the vicinity of Tokomaru, Linton, and on the west side near Rangitane, where a mill was opened in 1900, utilizing the flax growing along the river-bank. This flax has now died out, being replaced by a grass-belt between the present flax area and the river. During the winter of 1902 the remainder of the swamp —*i.e.*, south of Tokomaru—consisting of 12,300 acres, of which about 9,000 acres were in flax, was purchased from the Manawatu Railway Company by the newly formed Makerua Estate Company, which went to considerable expense in draining the area. Fires at this time were frequent, and practically half of the flax area was put down in grass after being burnt. However, there is now a good growth of flax in those burnt areas, which are considered the best flax land.

The Makerua and Moutoa are subject to heavy floods from the river. Within the past thirty years the most extensive flood took

place in June, 1902. In 1908 and 1909 there were less severe ones, while in 1913 they were very frequent on the lower levels. The flood of August, 1916, was considered fairly severe.

The grub first appeared and was very bad where the flax was being milled along the river-bank in 1902, just after draining. On account of this 11 tons of leaf was required to produce 1 ton of fibre, the normal in this swamp being about 8 tons of leaf. On the east side, at Miranui, the grub did not appear till eight years after draining, when it became serious during 1910 and 1911, gradually becoming less apparent till the present time. At Tokomaru the larval attacks reached their height during 1911.

The Makerua has subsided and consolidated considerably since the drains were cut.

The Moutoa Swamp was broken-in considerably before the Makerua, flax having been cut regularly from the former during the past thirty years.

LIME TREATMENT FOR POTATO-BLIGHT.

Mr. W. Harris, Fields Inspector, Ohakune, supplies some particulars regarding a means of controlling potato-blight by dusting the plants with lime. The treatment was adopted by him some years ago when farm-manager at the Papatoetoe Orphanage, near Auckland. He states: "This method was adopted when, in spite of steeping the tubers and regular spraying, the blight appeared, and by its means I was able to save crops when not a potato-plant was left standing within miles. I usually got a number of boys with buckets, and instructed them to throw the lime with force along the ground between the rows. The plants being wet (for the blight always appeared on a moist muggy morning) the lime adhered to every part of the plant, including the under-side of the leaves. The affected leaves soon fall off, leaving the stems stiff and erect with numerous young shoots still fresh and green, and usually within a week the rows are again filled up with luxuriant foliage. After leaving Papatoetoe I only grew small crops for my own use, and never sprayed at all, pinning my faith to the lime-dusting; sometimes two or three applications were necessary during the season. It may be luck, but I have never had a single blight-diseased tuber for ten years. I use shell-lime, but fresh hydraulic lime slacked as required would be just as suitable. The main idea is to have the lime fresh and to throw it between the rows with such force as to create quite a cloud over all the patch."

A development in carbonate-of-lime production which is worth recording is the attempt to utilize the huge deposits of Recent shells abounding on the littoral areas of the far North (Awanui) and on the Hauraki Plains. Some of these samples show a purity of 93 per cent., and 91 per cent. of the ground shells passed a $\frac{1}{12}$-in.-mesh sieve. This product, it is stated, is now sold at 22s. 6d. per ton, but it is hoped to reduce the price considerably.—*B. C. Aston.*

ORCHARD-SPRAYING EXPERIMENTS IN THE STOKE DISTRICT.

LAST year the Stoke Fruitgrowers' Association set up a committee to make orchard-spraying experiments in their district, near Nelson. A scheme was arranged accordingly, and carried out during the 1916–17 season. A report on the experiments was prepared for the committee—of which Mr. A. V. Allport is Chairman—and was read at their meeting on 30th June by Mr. W. C. Hyde, Orchard Instructor for the Nelson District, who is also a member of the committee. The report is as follows:—

SCHEME OF EXPERIMENTS.

Experiment Number.	First Application.	Second Application.	Third and Fourth Applications.
1. Mildew-spray ..	Atomic sulphur, 12½-100. (P.)	Atomic sulphur, 12½-100. Arsenate of lead (acid)	Atomic sulphur, 12½-100. Arsenate of lead (acid).
2. Mildew-spray ..	Atomic sulphur, 12½-100. (P.)	Atomic sulphur, 12½-100. Arsenate of lead (neutral)	Atomic sulphur, 12½-100. Arsenate of lead (neutral).
3. Mildew-spray ..	Lime-sulphur, 1-32. (P.)	Lime-sulphur, 1-100. Arsenate of lead (acid)	Lime-sulphur, 1-100. Arsenate of lead (acid).
4. Mildew-spray ..	Lime-sulphur, 1-32. (P.)	Lime-sulphur, 1-100. Arsenate of lead (neutral)	Lime-sulphur, 1-100. Arsenate of lead (neutral).
5. Peach-spray ..	Lime-sulphur, 1-10. (D.)	Lime-sulphur, 1-25. (P.)	..
6. Red-mite and aphis spray	Lime-sulphur, 1-10. (D.)	..	Usual summer sprays.
7. Black-spot spray on apples	Bordeaux, 8-6-40. (D.)	Bordeaux, 3-4-40. (P.)	Bordeaux, 3-4-40. Arsenate of lead.
7A. Black-spot spray on apples	Lime-sulphur, 1-10. (D.)	Lime-sulphur, 1-65. (P.)	Lime-sulphur, 1-80. Arsenate of lead. Later, lime-sulphur, 1-120.
7 (*a*). Pear-spray for black-spot	Bordeaux, 8-6-40. (D.)	Bordeaux, 3-4-40. (P.)	Bordeaux, 3-4-40. Arsenate of lead.
7 (*b*). Pear-spray for black-spot	Lime-sulphur, 1-10. (D.)	Lime-sulphur, 1-80. (P.)	Lime-sulphur, 1-65; 1-100; 1-120. Arsenate of lead.
8. Pear-spray for black-spot	Bluestone, 1-20. (D.) ..	Bordeaux, 3-4-40. (P.)	Bordeaux, 3-4-40. Arsenate of lead.

NOTE.—"P."—Pink spray. "D."—Dormant spray.

Subsidiary Tests.—(1) Lime-sulphur plus arsenate of lead applied on trees in experiment 7; (2) atomic sulphur plus arsenate of lead applied on trees in experiment 7; (3) atomic sulphur plus arsenate of lead applied on trees previously sprayed with lime-sulphur.

OBJECTS OF THE EXPERIMENTS.

Experiments 1 and 2 *versus* 3 and 4 had as an object the ascertaining of the better mildew spray—atomic sulphur or lime-sulphur—under Stoke conditions. They were duplicated to test the respective merits of acid arsenate of lead (Hemingway) *versus* neutral or triplumbic arsenate of lead (Sherwin Williams) when combined with the above.

Experiment 5 was an endeavour to find if lime-sulphur, 1-10, was as effective as bordeaux as a winter fungicide for stone-fruit under local conditions.

Experiment 6 was to ascertain to what extent lime-sulphur, 1-10, is effective as a winter spray for red mite, aphis, and scale.

Experiments 7 and 7A were carried out with a view for finding the best series of sprays to combat black-spot on the apple under the most difficult conditions.

Experiments 7 (*a*), 7 (*b*), and 8 had a similar object, but were carried out on pear-trees.

Three supplementary tests were made: (1) Lime-sulphur plus arsenate of lead was applied to apple-trees in full foliage that had been sprayed with bordeaux within the fortnight; (2) atomic sulphur plus arsenate of lead was similarly applied; (3) atomic sulphur plus arsenate of lead was applied to trees in full foliage which had been sprayed with lime-sulphur plus arsenate of lead within the previous fortnight. These three tests were carried out to test the danger of making changes in treatment at short intervals during the growing-period.

Before stating the results it is perhaps advisable to remind some growers of the dangers of generalizing. These results were obtained locally—at Stoke—in the 1916–17 season. Similar applications during future seasons, or in other localities, would probably give considerably modified results. Even so, while generalizing is dangerous, and the adoption of a rigid "system" fails in its object, the results of experiments carried out under exacting conditions are the very best data upon which a fruitgrower may act when deciding upon a series of orchard-spraying for the coming season.

MILDEW-SPRAYS FOR APPLES.

Experiments 1 and 2 (atomic sulphur) *versus* 3 and 4 (lime-sulphur) were carried out with the object of ascertaining the better mildew-spray. Two rows of Foster apples (twelve trees each), aged nine years, were used for this experiment. Though large and fairly well grown, they are very subject to mildew. At the end of August a dormant spray of lime-sulphur, 1-10, was applied to both rows.

On 23rd October, when the blossom was showing colour, one row was sprayed with atomic sulphur, 12½ lb. to 100 gallons water; the other row with lime-sulphur, 1 gallon to 32 gallons water. On 2nd November, when examined, it was noted that some of the new growth was affected with mildew.

On 22nd November a second application of atomic sulphur was made, 12½-100, plus 3 lb. arsenate-of-lead paste, half the row being sprayed with Hemingway (acid) lead, and the other half with Sherwin Williams (neutral) arsenate of lead. On the same date the other row of Fosters was sprayed with lime-sulphur, the petals having dropped, and the trees being in condition for what is known as the calyx spray—namely, lime-sulphur, 1-100, plus 3 lb. arsenate-of-lead paste, both varieties of lead being used as above. In mixing these leads it was noted that while the acid lead, when added to the lime-sulphur, turned the mixture a black unpleasing colour, the neutral lead under the same conditions hardly changed the colour of the lime-sulphur, and at the same time

appeared the more soluble. Only a moderate amount of mildew was showing on the trees on this date. On 29th November the trees were looking well, the crop generally being good, though very uneven. Two or three weakly trees in each row were difficult to clean of mildew

On 7th December the check trees unsprayed (except for dormant application) were in very fair condition. Of the two rows, that sprayed with lime-sulphur seemed the better and more free from mildew. No difference was then apparent between the trees sprayed with acid and those sprayed with neutral arsenate of lead.

A third application of atomic sulphur, 12½ lb. to 100 gallons water, was made on 11th December, the arsenate-of-lead paste being used as previously, the other row receiving lime-sulphur, 1-100, and arsenate of lead as previously.

Although many extremes of weather were experienced during the season, the trees generally finished well with bright foliage, fair growth, and clean fruit. The season perhaps was not a bad one for mildew generally. Experienced visitors gave the preference to the trees sprayed with lime-sulphur, though the difference was not great. To what extent was the very fair condition of the check trees due to the dormant spray, lime-sulphur, 1-10, applied on 31st August? When the crop was gathered there was nothing to choose between that sprayed with acid lead and that sprayed with neutral arsenate of lead, both being free of all stings and biting of insects. The difficulty of cleaning the weaker trees was noticeable, the vigorous trees being more responsive to treatment. Incidentally, it is interesting to note that both crops were free of black-spot.

WINTER FUNGICIDE FOR STONE-FRUIT.

Experiment 5 undertaken to ascertain the value of lime-sulphur as a winter fungicide for stone-fruit, was carried out on a large block of peaches of many varieties: Sneeds and Elberta (prone to leaf-curl), Triumph, Kalamazoo, Salway, Kia-ora, Lady Palmerston, Muir, Comet, Briggs Red May, and Admiral.

The first application was made at a strength of 1 gallon lime-sulphur to 10 gallons water, on 16th August, as the buds were starting. A second application was made at a strength of 1-25 on 9th September when the blossom was first showing colour (the season was unusually late). When examined on 23rd October the Muirs and Elbertas were slightly infected with green aphis, otherwise the trees were free from curl, and in good general condition, the only exception being two trees of Sneeds badly affected with curl, which had been left unsprayed as check trees. On 2nd November further examination revealed the same condition.

This result compares favourably with the experience in the peach-orchard of Messrs. Stead Bros., where the trees were sprayed with bordeaux, 8-6-40, on 12th August, followed by red oil, 1-25, on 20th August. In this case the trees were clean except for slight curl on one variety.

RED-MITE, APHIS, AND SCALE SPRAY.

Experiment 6 was to ascertain to what extent lime-sulphur, 1-10, is effective as a winter spray for red mite, aphis, and scale. For this purpose the application was made on a row of eight-year-old Delicious

apples badly affected with red mite, on 31st August, before the buds started. On 23rd October a close search discovered very few eggs, and of these most were bleached; in fact, it was considered that most of the original eggs had been displaced altogether. Trees of Munroe close by infected with red mite, and sprayed with red oil, 1-15, and later 1-25, showed eggs of a comparatively bright colour, the previous sample comparing with them quite favourably. These Delicious and others received the usual lime-sulphur and arsenate-of-lead summer sprays. On 7th December when these trees of Delicious were examined no mite was found on any of them. Munroes sprayed with red oil were also clean. Later the Munroes developed red mite; but it should be noted they had not been sprayed with summer lime-sulphur owing to the tenderness of that variety. Unfortunately, it was not possible to test this winter lime-sulphur on trees infected with scale and woolly aphis. Incidentally it should be noted the row of Delicious receiving the delayed dormant lime-sulphur, 1-10, spray was much more free from black-spot than adjoining rows of Delicious which did not receive the dormant spray, but received lime-sulphur summer sprays only. Lime-sulphur, 1-10, at last year's rates costs £1 0s. 10d. per 100 gallons, while red oil, 1-12, costs £1 5s. for the same quantity. For this season red oil has advanced in price.

BLACK-SPOT SPRAYS FOR APPLES.

Experiments 7 and 7A were carried out with a view to finding the best series of sprays to combat black-spot on the apple. For the purpose two rows of Dougherty apples, six years of age, were chosen. On the one row bordeaux, 8-6-40, was applied on 9th September, when the trees were dormant. It was intended to follow this up with "pink," "calyx," and other summer sprays of lime-sulphur, but, owing to the heavy rains of October following an already unusually wet season, it was decided to continue with the bordeaux. Accordingly bordeaux, 3-4-40, was applied on 13th October, when the blossom was showing colour; again, combined with Hemingway arsenate-of-lead paste, on 3rd November a calyx spray; and again on 29th November.

The other row of Dougherty received a dormant spray of lime-sulphur, 1-10, on 9th September; a "pink" spray of lime-sulphur, 1-65, on 4th October; a calyx spray of lime-sulphur, 1-80, with arsenate of lead, in November; and another lime-sulphur spray, 1-120, with arsenate of lead, on 4th December. This last application was repeated on 8th January and 31st March, the lime-sulphur being further diluted to 1-130.

On 23rd October the trees sprayed with bordeaux were in good blossom, with clean bright foliage showing signs of being buffeted by wind. The trees were more forward than those sprayed with lime-sulphur; the latter, sprayed with lime-sulphur in a heavy wind, showed extensive petal-damage. On 29th November it was observed that the Dougherty trees sprayed bordeaux had the fruit rather russeted; the foliage was conspicuously large and good, and there was little or no black-spot. The same variety sprayed lime-sulphur showed brighter fruit, fairly clean, with foliage not quite so good. On 7th December those trees sprayed with bordeaux had much the better foliage, some

spot, and considerable russet. Those sprayed with lime-sulphur had more spot, with fruit otherwise bright.

The crop was harvested early in May. In quantity the crop was excellent for the age of the trees, and from both rows it could be passed as free from black-spot. From the row sprayed with bordeaux the apples averaged 3 in. in size, somewhat russeted. The trees in the latter row had made more growth and, like the fruit, were of a more robust type than the trees sprayed with lime-sulphur.

BLACK-SPOT SPRAYS FOR PEARS.

Experiments 7 (*a*), 7 (*b*), and 8 were made with a view to comparing the effect of different series of sprays for black-spot on pears. For the purpose five large trees of a variety known as Chaumontel were chosen, as they had always been found to be specially subject to this disease.

Experiment 7 (*a*) was a series of bordeaux sprays; 7 (*b*), a series of lime-sulphur sprays; 8, a series commencing with bluestone solution followed by bordeaux.

On 6th September, the trees being then dormant, two were sprayed with bordeaux at standard winter strength (experiment 7 (*a*)) and one tree with bluestone solution (experiment 8). On 31st August two of the pear-trees had been sprayed with lime-sulphur, 1-15 (experiment 7 (*b*). All these were late dormant applications.

Experiment 7 (*a*) received further applications as follows: Bordeaux (summer strength) on 13th October, when the blossom was showing colour; again, combined with arsenate of lead, when the petals fell, 3rd November; and again the latter mixture was applied on 29th November.

Experiment 7 (*b*) received the following further applications: 13th October, lime-sulphur, 1-80; on the 30th of the same month a calyx spray of lime-sulphur, 1-65, with arsenate of lead; 30th November, lime-sulphur, 1-100, with arsenate of lead; 4th December, lime-sulphur, 1-120, with arsenate of lead.

Experiment 8 received the following further applications: On 13th October, bordeaux (summer strength); on 3rd November, calyx spray of bordeaux with arsenate of lead; on 29th November this last spray was repeated.

When examined on 30th September it was found that these five trees were "bleeding," the exuding sap giving them a thoroughly wet appearance in some instances. There was very little bleeding in the case of trees sprayed with lime-sulphur, but considerably more on those sprayed with bordeaux and others sprayed with bluestone. At the time the weather was unseasonably warm, but a cold snap following, all signs of bleeding vanished and did not recur. The trees had been pruned rather hard and late, the operation being closely followed by the dormant sprays and warm weather. From past experiences the late pruning alone hardly accounts for the phenomenon. It is possible that the sprays (under the circumstances) prevented or retarded the usual callousing of the cambium on the cut wood, and under the stimulation of warm weather bleeding commenced. No further effects have been observed, the trees now being normal in this respect.

On 13th October it was noted that the trees of experiment 7 (*a*) (bordeaux) and experiment 8 (bluestone) were already more forward than those of experiment 7 (*b*), which had received one application of lime-sulphur. No sign of the bleeding noted on the previous visit was to be seen. When examined again on 23rd October there was a comparatively good set of fruit, and the foliage condition was best on experiment 8 (bluestone). On 2nd November, when the trees were ready for the calyx spray, all showed slight spot on foliage and fruit. On 29th November the growth and foliage on experiments 7 (*a*) and 8 were conspicuously greater than on the trees in experiment 7 (*b*); also on the former some spot was showing, and the fruit was rather russeted, while on the latter there was some spot, but the fruit was brighter. On 7th December the following note was made: At the present time pear-trees sprayed with bordeaux are better than those sprayed with lime-sulphur, all of them showing spot, this variety being susceptible to it. The trees sprayed with bluestone in the dormant season have the cleanest fruit.

The crop was picked on 1st May. On the trees in experiment 7 (*a*), sprayed with bordeaux, 75 per cent. of the crop was clean of black-spot (the fruit being counted and carefully examined); the trees in experiment 7 (*b*), sprayed with lime-sulphur, had 65 per cent. of clean fruit; while trees in experiment 8 (bluestone followed by bordeaux) had 75 per cent.

The advantage of the bluestone dormant spray is easy manipulation and cheapness, the cost under present prices being 3s. 9d. per 100 gallons, against 16s. 3d. per 100 gallons of bordeaux, or £1 0s. 10d. per 100 gallons of lime-sulphur at a strength of 1-10.

SUBSIDIARY EXPERIMENTS.

Subsidiary experiments to ascertain the danger of burning, if any, when sprays of a totally different nature are applied to fruit-trees successively were undertaken during the season through some growers burning their trees and attributing the cause to a change of spray. Three of these changes were tried, as follows: (1.) Lime-sulphur, 1-100, plus acid arsenate of lead, was applied on 11th December to a number of trees of Dougherty apples which had been sprayed with bordeaux and lead twelve days previously. (2.) Atomic sulphur, 12½ lb. to 100 gallons of water, plus arsenate of lead, was applied to similar trees on the same date. (3.) Atomic sulphur, 12½ lb. to 100 gallons of water, plus arsenate of lead, was applied to trees previously sprayed with lime sulphur. In neither of the above instances was there any apparent injury of any kind.

Throughout the above experiments it is interesting to note the absence of any scorching, with only one exception, and that was in the case of the pink spray in experiments 3 and 4, where, owing to an error in measuring, the actual strength of the lime-sulphur was 1-28. This caused slight burning of the foliage.

On 21st November Mr. F. Hall wrote suggesting "that as the humidity of the atmosphere is a very large factor in the success and failure of orchard-spraying an instrument be secured to determine this important point." As the suggestion was perceived to be valuable

and to the point, an application for the loan of instruments was made to the Director of the Horticulture Division, Wellington, with the result that a Lloyd's hydrodeik and maximum-minimum registering thermometer were supplied and set up in the orchard in which the experiments were being made. Since then daily readings have been taken of the temperatures and the humidity of the atmosphere. These will be considered, with the action of parasitic fungus in the orchard, also the action of the different sprays, specially the scorching sometimes experienced with lime-sulphur, and an endeavour made to determine the relationship of these factors to one another. Sufficient work upon which to base conclusions has not yet been done, but it is possible that useful results may be obtained from this source.

SUMMARY.

1. Lime-sulphur proved rather a better remedy for apple-mildew than atomic sulphur, 12½ lb. to 100 gallons water.

2. No practical advantage was observed in favour of the neutral arsenate of lead or the acid lead.

3. Two lime-sulphur peach-sprays in the spring were effectual in preventing curl and other fungus diseases.

4. A dormant spray of lime-sulphur followed by the usual summer sprays was a satisfactory remedy for red mite on trees of apple Delicious.

5. In the test of bordeaux *versus* lime-sulphur on Dougherty apples for black-spot a full crop of clean fruit was secured in each case. In the first case the fruit was somewhat russeted and larger, with stronger growth and larger foliage; in the second instance foliage, growth, and fruit were smaller, but the skin of the fruit was clear and bright.

6. On pear-trees specially subject to black-spot, and in a bad season, bordeaux secured a 75 per cent. clean crop; lime-sulphur, 65 per cent.; and bluestone followed by bordeaux, 75 per cent. In addition, trees sprayed with bordeaux had made the more vigorous growth.

7. Lime-sulphur plus arsenate of lead, also atomic sulphur plus arsenate of lead, was applied without detriment to apple-trees sprayed twelve days previously with bordeaux plus arsenate of lead.

8. Atomic sulphur plus arsenate of lead was applied without detriment to apple-trees sprayed twelve days previously with lime-sulphur plus arsenate of lead.

9. Apple and pear trees receiving a late dormant fungicide spray bore crops conspicuously cleaner than those of trees which had not received that treatment.

All the fuel used for household purposes at Arataki Horticultural Station (Hawke's Bay) is wood from a belt of gum-trees on the property. These trees, and other fine plantations of eucalypts in the vinicity, were personally sown *in situ* by Mr. Bernard Chambers, of the adjoining Te Mata Estate, some thirty-five years ago. Mr. Chambers has recently had handsome returns from some *Eucalyptus viminalis* trees of the same age sold for timber purposes from his property.

EFFECTIVE SOIL-TREATMENT IN WESTLAND.

ALTHOUGH the West Coast district of the South Island may not be so advanced agriculturally as some other parts of the Dominion its potentialities in this respect are steadily becoming recognized. The following particulars and accompanying illustrations give tangible evidence of what can be done by proper soil-treatment on large areas of the district.

CUTTING THE SECOND HAY CROP ON THE LAND NEAR GREYMOUTH.

Some 35 acres of alluvial land with a stiffish clay subsoil, immediately to the south of Greymouth, were stumped by explosive (gelignite), this operation tending to subsoil the land. After the land was cleared it was drained by means of open ditches cut through the low-lying portions. Approximately 1 ton per acre of burnt lime was applied to the ploughed land, together with, in all, 5 cwt. of basic phosphate, half of which manure was, however, applied to the land before it was ploughed. A grass-mixture consisting of timothy, cocksfoot, Italian rye, perennial rye, and cow-grass was sown in March, 1916. During June, July, and August the 35 acres were grazed with 125 sheep, while during September and October thirty

breeding-ewes with lambs were kept in the paddock. Eleven acres of the area was subsequently closed for hay, and at the end of December some 30 tons of mixed-grass hay was gathered, or approximately 3 tons per acre. At the end of February a second crop of some 15 tons of cow-grass hay was gathered from the same 11 acres. In many parts the cow-grass was 4 ft. 6 in. high. All the hay was saved without rain. On 23rd March last, when the writer visited the land, there was a good third growth, consisting of 15 in. of vegetation, principally cow-grass.

It should be stated that last summer was unusually dry in the Westland District, and as a consequence haymaking was everywhere greatly facilitated. Nevertheless, hay can be made in most years in parts of the district.

The foregoing data were supplied by Mr. P. J. McLean, of Greymouth, the owner of the land, and to whom the credit of the operations is due.—*A. McTaggart, M.S.A., Agriculturist, Fields Division.*

A sample of lucerne-meal prepared by the Department for feeding to poultry at its poultry-stations, and analysed by the Chemist, contained 20 per cent. of proteids. This meal has shown itself to be a most valuable food.

A seven-year-old Friesian cow recently sold fat from the Weraroa herd scaled 1,652 lb. live-weight, and realized (at 40s. per 100 lb. beef), £20.

REGISTRATIONS OF FACTORIES, ETC., UNDER THE DAIRY INDUSTRY ACT AT 30TH APRIL, 1917.

District.	Creameries (Butter).	Factories (Cheese).	Private Dairies.		Packing-houses (Milled Butter).	Totals.
			Butter.	Cheese.		
Auckland	56	58	1	1	11	127
Taranaki	40	104	17	..	4	165
Wellington ..	22	65	..	3	13	103
Hawke's Bay ..	12	24	..	..	..	36
Nelson	7	5	..	..	9	21
Marlborough ..	4	7	..	..	..	11
Westland	6	3	..	..	..	9
Canterbury ..	10	18	1	18	1	48
Otago and Southland	7	108	..	..	4	119
Totals, 1917 ..	164	392	19	22	42	639
Totals, 1916 ..	173	381	59	24	65	702

WORK FOR THE COMING MONTH.

THE ORCHARD.

J. A. CAMPBELL, Assistant Director, Horticulture Division.

PRODUCTION AND DISTRIBUTION.

It is generally acknowledged among the fruitgrowing community that the past season was anything but a highly satisfactory one. In this the consumer of fruit is disposed to agree. These conclusions, however, are arrived at from somewhat different points of view. The grower was mainly concerned with the light crops which were the general rule, and also in the protection of his crop from further reduction through the ravages of fungus diseases, which, owing to abnormal climatic conditions, were unusually severe in most districts. The consumer, although not particularly interested in these matters, was necessarily affected by them, and, as a result, was called upon to pay a higher price for his fruit than he altogether cared about. Consequently, both parties unite in condemning the season.

As far as the higher retail prices of fruit are concerned the consumer had a legitimate grievance; as a matter of fact, he always has. But his grievance was not altogether with the fruitgrower, as there is usually a considerable difference (and this also applied last season) between the price the consumer has to pay for his fruit and that received for the same fruit by the orchardist. The only person who sells cheap fruit is the orchardist himself, and he, as a rule, disposes of very little of his crop directly to the consumer. Apart from what is sold directly by the orchardist or through his associations, there is rarely any cheap fruit to be had in New Zealand. The fluctuation of seasons merely means to the consumer the difference between dear fruit and dearer fruit. The reason of this is that low prices are rarely passed on to their fullest extent, while high prices always are. Unfortunately, there is little hope of relief until a much improved and a more direct means of distribution has been devised. When such a scheme, which is urgently desired, is introduced—and there are hopes that it will be attempted shortly—it will be to the interest of the purchasing public to support it in every way possible so as to ensure success.

Reverting to the fruitgrower and the effect of last season upon his industry, he has the doubtful consolation of knowing that the position might have been worse. Judging from Australian reports, the fruitgrowers there in many localities suffered quite as much as ourselves through unfavourable weather conditions and, unfortunately, to a very much greater extent through the lack of shipping-facilities; in fact, they were doubtless altogether in a worse position than New Zealand growers. Tasmanian reports are to the effect that in order to relieve the markets arrangements are being made in that State to dry a million cases of apples; while for the same purpose next season the Government is being asked for authority to destroy a considerable portion of the new season's crop. If these reports are correct, the loss of their export trade must have brought about a serious position in the Tasmanian industry.

This goes to show what might have happened to a lesser extent in New Zealand had last season's crops been above, rather than below, the average, as past experience goes to prove that, under the existing methods of marketing, we can raise more fruit in a normal season than can be disposed of at payable prices within the Dominion. Therefore if we wish to avoid any semblance of the Tasmanian position it will be necessary to immediately effect considerable improvements in the distribution and sale of fruit within the country, as all hope of the position being relieved by means of export appears to be out of the question until the war is over.

In this connection the light crop of last season may not have been an altogether unmixed evil for the industry, as it not only gave the newly constituted co-operative fruit companies another year in which to further organize their businesses, but also ensured satisfactory prices for all fruit available for market. Whether the higher prices were sufficient to compensate growers for lighter crops and the labour and expense of combating diseases is another matter. No doubt in many cases they were not; but at the same time it is quite possible that the position was far more satisfactory than would have been the case had there been abundance of fruit on hand with no adequate means of disposing of it.

A light crop is bad enough, but the excessive loss of fruit through disease is much worse. No fruitgrower likes to lose his fruit in this way, and that is what happened last season. Brown-rot and black-spot were particularly bad, mainly owing to the excessive amount of rain that fell more or less throughout the season in most districts. Black-spot is a disease well known to New Zealand orchardists, while brown-rot is comparatively new, making its first appearance in several districts last season. In either case a little advice in combating them may be of advantage, as, judging by the climatic conditions

up to the present, no small amount of trouble may be expected from them during the coming season.

BLACK-SPOT.

There are many orchardists who claim—particularly after their experiences of last season—that black-spot cannot be controlled by spraying. Whether this is to be admitted or not depends upon the degree of cleanliness necessary before a verdict in favour of spraying can be given. In ordinary seasons there is no great difficulty in keeping both apples and pears almost entirely free of the disease, but the position is somewhat different when the climatic conditions are highly favourable to the disease. Under such circumstances it appears to be practically impossible to prevent a certain percentage of the fruit of a tree, particularly of some varieties, becoming affected. At the same time, under the most unfavourable conditions, spraying, if properly carried out, will prove so far successful as to bring black-spot well within the category of controllable diseases.

So far, of course, these remarks apply to the summer form of the disease, as it is claimed by many authorities, and is no doubt correct, that spraying has little effect upon the ascospores or the winter form of the disease. This being the case, it becomes essential to assist the effect of spraying by destroying as far as possible everything about the tree which harbours the winter form of the disease. This includes dead leaves, fruit (such as the mummified fruit common to the Sturmer, Reinette du Canada, &c.), and dead and diseased wood. If this is not done, and done thoroughly, the disease is liable to break out, when conditions are favourable, at almost any time during the season, despite previous spraying. With reference to the innocent-looking dead leaf, Mr. H. M. Nicholls, Government Microbiologist of Tasmania, writes: "It is as well that the fruitgrower should begin to understand that the simple dead leaf that lies about beneath his feet is really one of his greatest enemies."

Where circumstances permit, autumn ploughing should be carried out after the leaves have fallen, and all old leaves thoroughly turned under. These will then be well rotted by the time spring cultivation commences. The next best thing to be done, with the same object in view, is to plough the land some time before the blossoms appear. If this cannot be done, and it is recognized that, particularly in heavy lands, ploughing at this period is often extremely difficult, the soil round about the trees should be disturbed as little as possible until after the fine weather has set in, and the first, and possibly the second, spraying has been done.

No doubt a great deal depends on pruning. Trees should be thoroughly pruned and trained, so as to provide for plenty of venti-

lation. All dead and diseased wood should be carefully cut away and destroyed — not left lying round about the tree. Nothing should be allowed to interfere with the carrying-out of the work above referred to, otherwise the disease is liable to cause considerable damage, and it will be useless to blame the inefficiency of spraying. Old and unpruned trees present a problem, particularly in a bad season. Not only is it next to impossible to spray them thoroughly, but even were this successfully accomplished it is doubtful whether anything like a clean crop would be gathered.

With reference to spraying, this should commence when the buds are well on the move, somewhere about the middle of September. At this stage the mixture should be 8-6-40 bordeaux. Spray again when the buds show colour with 6-4-50 bordeaux. All sprayings should be thoroughly well done under a high pressure. Subsequent sprayings, which will be dealt with later, are to an extent influenced by the class of fruit-tree in question, and the requirements of the season.

BROWN-ROT, LEAF-CURL, ETC.

Brown-rot was dealt with in these notes in April last, and will be further covered in next month's *Journal*. All that is required in the meantime as regards peaches and nectarines is to apply the ordinary curl-spray, 8-6-40 bordeaux. Similar treatment should be given to other stone-fruits when the earliest buds show colour. In all cases, however, the destruction of old foliage, mummified fruit, and dead and diseased wood, should be attended to as with black-spot.

SPRAYING.

During the early part of the month at least practically all winter sprays may be used at full strength.

Pip-fruits: For scale, red mite, woolly aphis, mealy bug, &c., spray with red-oil emulsion — North Island, 1-12 to 1-15; South Island, 1-8 to 1-10.

Stone-fruits: For red mite, &c.—Oil-emulsion, 1-15.

Stone-fruits: For fungus diseases, including peach-curl, brown-rot, &c., 8-6-40 bordeaux. Apply when early blossoms show colour.

PLANTING.

August is a favoured month in most districts for the planting of fruit-trees, as the conditions of both weather and soil are usually favourable. The work, however, should not be attempted while the soil remains in anything like a waterlogged condition, but should be deferred till conditions improve.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

THE HATCHING SEASON.

AUGUST is one of the best months for hatching out chicks of the heavier breeds, such as Orpingtons, Rocks, Wyandottes, &c.; therefore no time should be lost during the coming month in securing the full complement of chicks required of these breeds. In the case of the lighter breeds—Leghorns, Minorcas, &c.—eggs should be placed in the incubators or under broody hens, so as to be hatching out about the end of September or early in October. This advice, of course, is only intended for the breeder who is conducting the business on a small scale. The large poultryman must necessarily extend the time of his hatching season in order to secure his desired number of birds, unless, of course, he has an exceptionally large amount of incubator and brooder capacity. When hatching chickens the object should be to have the pullets commencing to lay at the beginning of the dear-egg season—say, in April. The great drawback to having the pullets hatched out too early is that they usually go into a moult with the old fowls, just at the time when winter eggs are expected.

While August for the heavy breeds and September for the light breeds are the most suitable months, it should be remembered that it is always better to have the chicks brought out a month too early than a month too late. Birds hatched in November and December are always undesirable. Not only are they short-seasoned layers of small eggs, but they produce these in the cheapest season of the year; besides, they never make good breeding-stock, and are, in addition, always more prone to disease than birds hatched at the right time. There are no chickens that do so well as those that attain a fair stage of development as the days are lengthening. It stands to reason that very young chickens having to contend against the hot, trying summer weather conditions, to be followed by cold snaps often experienced, cannot possibly make the best growth. Therefore, see to it that all the chickens are hatched out not later than the end of October.

CARE OF THE BREEDING-PEN.

To secure the best results, whether it be with incubators or the natural mother, the first essential is to know that the breeding-birds are in the best possible condition. Instances could be stated where over and over again poor hatches and heavy losses of chickens could all be traced to the use of underfed and debilitated breeding-stock. Strong

chicks imply strong germs, and strong germs only come from vigorous parents. In the first place, the breeding-birds require ample exercise, and the best way of providing this is to give as much range as possible.

On no account must breeding-hens be forced for egg-production. Rich foods, such as meat or its substitutes, should be fed sparingly. In fact, when a good range is provided better fertility and stronger chicks will be produced if only whole grains are supplied. Breeding-birds should be given a variety of foods. Wheat, maize, and oats fed on alternate days are quite suitable. Of course, green food is an essential, and too much of it cannot be supplied, while grit, charcoal, and clean water should always be before the birds.

The condition of the male is a common cause of infertile eggs and weak germs being produced. It often happens that the male is too attentive to the hens and does not take sufficient food for the maintenance of good health and vigour. Breeding-males should be frequently handled when on the perch at night, and when a bird is found to be out of condition he should be fed at least once a day by himself, or, better still, replaced with another. On all plants there should be spare breeding-males, in case of accident or sickness taking place. Never breed from a male or female that has apparently recovered from some disorder. If satisfactory results are to follow, none but the strongest specimens should be allowed to produce their kind. Where old cocks are used about three parts of the spur should be removed by means of a fine saw. Practically no bleeding will take place if a little Stockholm tar is applied to the wound. Long sharp spurs are not only a common cause of infertile eggs being produced, but of hens' sides being badly ripped as well.

THE SITTING-HEN.

The first essential when setting a hen is to see that she is absolutely free from vermin. The hen should be well dusted with an insect-powder before being entrusted with the eggs, and again prior to hatching. On no account should this be done when the chicks are very young, as the powder is apt to get into the little ones' eyes and cause blindness. Not only should the hen herself be clean of vermin, but care must be taken to see that the nest-box and coop are free from the presence of red mite. The hen should be isolated from the poultry-house, as few of these are as free from vermin as they might be. Another advantage of keeping the sitting-hen away from the poultry-house is that she will not be disturbed by other members of the flock. Undoubtedly the presence of vermin and the continual disturbance by other hens are the most common causes of hens leaving their nests before the hatching takes place. A hen will usually sit better if the nest is made in a rather dark place. It is a mistake, however, to set a hen in a very dark room. Sufficient light

should be provided to enable her to leave and return to the nest as she pleases, otherwise the bird is apt to foul the nest to the detriment of the hatch.

NEST-MANAGEMENT.

In making the nest take a shallow box without a bottom and place this on the ground or the floor of the coop. Half-fill the box with soft earth, and with the hands hollow it out in the centre; in other words, make it into saucer-shape. Care must be taken to fill the corners to prevent any eggs from rolling into them and becoming chilled. Upon this earth place a thin layer of hay, fine straw, or pine-needles. When the eggs are placed in the nest they should have a slight tendency to roll to the centre, but on no account should they be too much confined, as the hen must have the necessary room to turn the eggs, which she does several times a day. It is always a good plan to try the hen first on some dummy eggs before entrusting her with the eggs to be hatched. She will take to the eggs much better if placed on them in the evening. It is a mistake to put too many eggs under a hen. With ordinary-sized eggs and a medium type of bird twelve to thirteen should be sufficient.

If several hens are set at the same time it will be found economical and convenient to test the eggs on about the fifth day. Should a good percentage of the eggs be infertile, the fertile ones can be transferred to make up complete sittings, and a new batch of eggs given to the bird or birds relieved by the testing-out process. This system of managing sitting-hens enables a much greater number of chicks to be hatched by a given number of hens. Another important point in testing the eggs is that the infertile ones, which would otherwise be wasted, can be used for culinary purposes. Sometimes an egg gets accidently broken, and unless the nest is properly cleaned and the remaining eggs are washed in warm water their hatching-qualities are apt to be spoilt. The nest should be examined every day, and when an egg is found to be broken great care should be exercised in lifting the hen off the nest to do the cleaning, or, owing to the contents of the broken egg adhering to the birds' breast-feathers as well as the remaining eggs in the nest a further smash is apt to take place.

When the young birds are hatched there is no hurry to feed or move them for at least twenty-four hours. The egg-shells should be removed, and the nest made as comfortable as possible. The hen should be given a good feed and drink as soon as the hatch is cleaned up. The food should not be thrown into the nest, as the hen, in order to find it, may be induced to scratch the nesting-material about and bury the chicks up as a consequence. The food should be supplied in a narrow dish or something of the kind. The front board of the nest should be removed, so that in the event of a

chicken getting out of the nest it can easily return to it. Failure to take this precaution of allowing the hen to keep the chicks under proper control is a most common cause of chickens becoming chilled, and death taking place as a consequence.

THE CHICKEN-COOP.

Before the chickens arrive the coop should be well disinfected, and bedded down with dry earth, sand, or pine-needles. It should be placed in a well-sheltered, sunny spot, and, if possible, on a piece of fresh ground where fowls have not had access for some time. Clean, fresh ground and shelter from cold winds are essential in successful chicken-rearing. It is always advisable to have a floor to the coop, unless, of course, it is placed under shelter. The floor of a chicken-coop should be separate from the coop itself, and made to fit tightly inside. The coop can then be lifted off, and the floor cleaned regularly. It is always best to have the coop slightly raised above the ground-level in order that the floor may be kept dry. The chicken-coop should be ratproof and rainproof: this will save chickens and also worry.

FEEDING OF CHICKENS.

Where only a few batches of chickens are to be raised, and there is no machine for grinding the different grains, it will usually be found economical and convenient to use one of the reliable commercial chick-foods that are on the market. No matter what grain-food is used it should be slightly moistened with milk or hot water some time before using. This will cause it to swell, and prevent it from doing so in the chicken's crop. Of course, this is only necessary when the chickens are very young.

THE APIARY.

E. A. EARP, Apiary Instructor.

SPRING WORK.

WHENEVER the temperature will allow advantage may be taken of mild spring days to give the colonies their first inspection of the season. It is highly important that this work should be undertaken early, and not postponed until brood-rearing has commenced in earnest. By this time small patches of brood will be found, and under favourable conditions the quantity will rapidly increase, but just in proportion to the amount of food available so will brood-rearing proceed. On no account should the examination be postponed indefinitely if it can be avoided, or in all probability losses will be recorded through starvation. During the dormant season

the drain on the stores is small, but once the activities of the hive commence no effort should be spared to see that each individual colony has sufficient food to meet current demands. Colonies containing at this season 15 lb. to 20 lb. of honey may be left undisturbed for some weeks, but failing this amount preparation should be made for feeding. (See Bulletin No. 55, p. 37, "Spring Feeding of Bees.")

SUPERS.

In order to facilitate brood-rearing supers left on during the winter months may now be removed, and the bees confined to the brood-chamber. In cases where bees are found in the super remove the deserted brood-combs, and place the super containing the bees on the bottom-board. Make all the hives snug, and provide each with one or two extra mats. These will help to conserve the heat of the hive.

QUEEN-RIGHT COLONIES.

As indicated, an important matter in connection with the first examination of colonies is to note the extent of brood-rearing in progress. This will largely determine whether the colony has a laying-queen. Do not hastily conclude that a colony is queenless if brood is not visible, as much depends on the locality and weather conditions preceding the examination. If the colony is strong and normal the question of queenlessness may be postponed until a later date. Make a note of each hive and its condition for future reference.

APIARY RECORDS.

At every examination the beekeeper should make a record of the condition of his hives with regard to stores, brood, health, and fertility of queen. These records are invaluable, and enable one to proceed about one's work systematically. Where time and labour are considerations notes made at the time of inspection will save confusion and endless trouble. A pencil note on the inside of the cover or on a piece of section and placed under the roof is handy for reference if by any chance the notebook be mislaid.

SUPPLIES OF FOUNDATION.

As advised last month, do not neglect to provide ample comb-foundation for the coming season. A supply should always be kept on hand. Make a note of the colonies to be treated and what increase you have decided upon. Ascertain as far as possible your requirements, and place your orders with the dealers in supplies.

PREPARATION FOR THE SEASON.

The beekeeper should, as far as possible, utilize his spare time in making preparation for the coming season. Generally there is a

good deal of work which can be undertaken now. Push on with hive and frame making if increase has been decided-upon, and with the overhauling of any faulty supers, roofs, and bottom-boards. Usually when the bees are absorbing the greater part of the bee-keeper's attention he will find very little time to attend to the mechanical part of the work. Do not postpone ordering your supplies. Beekeepers who are not skilful with tools will find it more profitable to purchase their hives from the manufacturers. You can depend on the machine-made hives, as they have been brought to a high standard of perfection.

When purchasing new supplies aim at uniformity. Do not be tempted to purchase job lines of bee-material because dealers have represented the lines to be cheap. Standardize your hives, and endeavour each season as far as possible to dispense with badly fitting supers, &c. Nothing is more tantalizing than to find your supers will not fit your bottom-boards, or that your roofs are an inch or so too long. You cannot afford to neglect your working-plant. Good standard hives are among the essentials that lead to profitable management.

FRAME MAKING AND WIRING.

A great deal of time must necessarily be spent performing this very important part of the work. The assembling of brood-frames and extracting-frames should receive every consideration. There are many plans for curtailing the labour involved, but, whatever method is adopted, strict attention must be given to proper nailing. Neglect to secure frames properly will lead to endless worry when the frames are in use. In districts where the bees gather propolis in large quantities too great caution cannot be exercised in nailing. It is not sufficient to drive a nail down through the top bar into the end bar. Too often the top bar will come away, and leave the end bars jammed by the pressure of the other frames and adhering propolis. To guard against this trouble, the end bars should be nailed to the top bar by driving two nails through the end bars parallel with and into the top bar. This will secure the frame and prevent it from breaking when in use. On no account dispense with wiring the frames if the combs are to be extracted. Good wiring will enable the beekeeper to handle his combs freely, and even on very hot days there is no risk of their falling from the frames, as is the case when wiring is not adopted. In using full sheets of foundation it is a distinct advantage to use wire. This holds the foundation in position, and good straight combs are produced. See that the wires are tight and securely fastened. Cut the wire into lengths of about 60 in., and bind in the centre; the strands can then be pulled out as required.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

ASPARAGUS beds should now be put in order. Where there are raised beds a coat of manure should have been put on them, as advised at the proper time, the top soil being removed down to the crowns. The soil may now be thrown up on the manure, which will have settled down. A dressing of salt should be given after the soil is returned—4 oz. per square yard is not too much. In case there was no manure available to top-dress with, a substitute should be found. As the crowns tend to come to the surface some additional soil is beneficial, but where manure is applied it is, of course, not necessary. A mixture of good garden soil, with a proportion of ashes from a rubbish-fire, or sand, or both, with a 6-in.-potful of bonedust to each barrow-load, would make a good top-dressing put on 3 in. or 4 in. thick. Nitrate of soda, 2 oz. per square yard, should be applied on top. Where the asparagus is planted in rows on the flat the surface soil should be lightly forked over. If blanched heads are required the rows may be moulded up in a manner similar to moulding potatoes. The heads will come up through the ridges, and should be cut low down. Apply nitrate of soda as previously specified. Planting asparagus may be undertaken towards the end of the month in early places, but must be deferred till next month in cold places. The heads should be on the move when planting is done. Planting in narrow beds is not now advised, nor are the elaborate preparations and heavy manuring formerly in vogue now thought to be necessary. Well-trenched and thoroughly drained soil is all that is needed. Manuring is best done from the top, so that the roots may get the fertilizing properties that are washed in by rain. A profitable distance to plant is in rows 3 ft. apart and at least 30 in. between the plants. To plant, take out a trench spade wide and 6 in. deep. With a rake draw up soil from each side of the bottom of the trench to form a ridge along its centre, the top of the ridge to be 3 in. from the surface of the soil. The plants are to be set with roots outspread astride the ridge, and then covered with the soil thrown out. When the young plants show through the surface give nitrate of soda, 1 oz. per square yard, repeating it in about six weeks.

Seakale: If all the crowns have not been forced the remainder may be blanched by covering them with boxes, with soil thrown on top to ensure darkness. Forcing will not be necessary now, as the crowns will be starting naturally. New beds may be formed by purchasing plants, by seed, or by whips of the roots. The latter

method is the one generally employed. Roots are dug up from the old crowns, and pieces somewhat thicker than a lead-pencil are cut to about 6 in. lengths, care being taken to lay them all one way. The end of each piece that was nearest to the crown is to be regarded as the top. Plant the whips with the tops just level with the surface. They may be planted 6 in. apart for transplanting, or in clumps of three 30 in. apart, each three whips to be planted 6 in. apart in a triangle. Keep a watch for slugs.

Cauliflowers, cabbages, and lettuces should be planted at once unless the spring crop is already out, as it should be. Seeds of these vegetables may also be sown; the two former may not be wanted, but lettuces should be sown as a matter of routine. Cauliflowers and cabbages are at times rather erratic in growth during spring-time, but if they have been well manured a little nitrate of soda will push them on, giving 1½ oz. per square yard. If the soil is poor give also 2 oz. of superphosphate and the same quantity of blood and bone, each per square yard.

Jerusalem artichokes should be planted during the month. Medium-sized tubers are best for planting; large tubers send up too many stems. Two or three stems are ample; if more come they should be pulled out; many stems means a crowd of small tubers. Plant 15 in. apart in the rows; if there is more than one row they should be not less than 3 ft. apart. In windy places these artichokes provide good shelter for less hardy crops, such as French beans. If the tops of the stems are cut off when about 4 ft. high they branch and make an excellent breakwind.

Leek-seed may be sown for an early crop in a shallow drill for transplanting. Sow turnips, but only a small breadth should be put in, as they do not remain long fit for use during the summer months. Extra Early Milan is the quickest variety I know of, though I prefer Snowball, which comes in nearly as early as the Milan. Sow peas twice a month. Early Horn carrot should be sown. Turnip-rooted beet and turnip-rooted parsnips may be sown. Transplant onions, and sow for the main crop. Sow radish and parsley, also thyme, marjoram, and winter savory. Plant rhubarb in well-manured ground, using roots with from one to three good crowns, 30 in. apart each way. Sow tomato and celery seed under glass. Planting potatoes is now an important operation, but was sufficiently dealt with in the last issue of the *Journal*.

SMALL FRUITS.

Cape-gooseberry plants may be set out as soon as danger from frost is past. Plants that were raised in autumn produce more fruit the first year than do spring-raised plants. The plants can be raised as quickly as tomato-plants, and for this reason they are usually

raised in spring. Many years' experience, however, has proved that autumn-raised plants are best, being hardier when put out, and making better plants generally. There are various ways of planting; for culture in the open I prefer to plant in clumps of three, the plants about 6 in. apart, set in triangles, and the clumps 5 ft. apart The plants lock together, and wind cannot injure them.

August is a good month for planting strawberries; in fact, if the soil is heavy or weedy I prefer to plant in August. The soil can be worked right up to the time of planting, and so is sweet and clean when the plants are put out; a great saving in labour is effected, and the plants do much better than they would if the ground had become weedy and sour. The soil would most certainly become sour if a wet winter followed autumn planting, as newly planted runners do not make enough roots through winter to fully occupy the soil.

REGISTRATION OF APIARIES.

REGULATIONS under the Apiaries Amendment Act, 1912, for the free registration of apiaries were gazetted on the 12th July, 1917, and came into force on the same day. The text of the regulations is as follows:—

1. For the purposes of these regulations—
"Director" means the Director of the Horticulture Division of the Department of Agriculture, Industries, and Commerce:
"Apiary" means any place where bees are kept:
"Beekeeper" means any person who keeps bees or allows the same to be kept on any land occupied by him, or who has in his possession or allows to be kept on any land occupied by him any appliances that have been used in connection with apiculture.

2. Every beekeeper shall, on or before the 15th day of August, 1917, and in the month of June in the year 1920 and in every third year thereafter, make application to the Director, in or to the effect of the form in the Schedule hereto, for the registration of his apiary; provided that in the event of (*a*) any apiary being established, or (*b*) any apiary being transferred from one beekeeper to another, subsequent to the gazetting of these regulations, application for the registration of such apiary must be made as directed within twenty-one days after such establishment or transfer has been effected.

3. Forms of application for registration of an apiary shall be obtainable, free of charge, from the Director, or from any District Agent or Apiary Instructor of the Department of Agriculture, Industries, and Commerce.

SCHEDULE.

Application for Registration of an Apiary.—Name of applicant: .
Address of applicant: . Location of apiary: . Number of hives:
Italian bees, ; black bees, ; crossbred bees, .

To the Director of the Horticulture Division, Department of Agriculture, Industries, and Commerce, Wellington.

I HEREBY apply, in pursuance of the regulations under the Apiaries Amendment Act, 1913, for the registration of the above-described apiary, of which I am the beekeeper.

Date: . ——— [*Signature.*]

Forms of application are obtainable from the District Agents of the Department at Auckland, Napier, Wanganui, Christchurch, Dunedin, and Invercargill; or from the Director of the Horticulture Division, Wellington; or from any of the larger post-offices throughout the Dominion.

ANSWERS TO CORRESPONDENTS.

IN every instance a question to which an answer is desired in the *Journal* must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written on one side of the paper only.

LICE ON HORSE.

G. H. R., Riverhead :—

Kindly advise me what to do for lice on a horse, and whether it is advisable to cut the hair off his legs. He is a heavy draught horse and is in good condition.

The Live-stock Division :—

It is advisable to clip the horse all over, and burn the clippings, before applying any dressing to get rid of lice. We have found that a kerosene emulsion, made with a solution of soap-water at a strength of 1 in 7, has a beneficial result. It is customary to apply a second application in about seven or eight days, in case the first dressing did not destroy all the nits. The horse-rug, and anything which has been in contact with the animal, should be disinfected; and the stall or loose-box, if used, requires spraying with kerosene, or whitewashing with a disinfectant mixed in the whitewash.

CREAM-SEPARATOR-BOWL BALANCING.

"POVERTY BAY," Patutahi :—

When a cream-separator is set perfectly level and the bowl is off the balance, what are the indications? How do you find out which side of the bowl is the heavier and which the lighter?

The Dairy Division :—

A cream-separator bowl may be said to be out of balance if running badly when the frame is perfectly level and the spindle and bearings are in good order. Bowl-balancing can only be successful when carried out by a man who has had experience in the work, and we think it would not be wise for any one else to attempt it. We understand, however, that the operator runs the bowl and decides as the result of the vibrations where the weight requires adjustment. We always recommend that these separator-bowls should be sent to a firm which employs a specialist for this work.

STRYCHNINE FOR RABBIT-POISONING.

"RABBITS," Otago :—

Please advise me in regard to the following: (1.) The quantity of strychnine to use per pound of carrots to poison rabbits. (2.) Would the quantity per pound be the same if apples, quinces, or swedes were used instead of carrots? (3.) Is it possible by using a certain amount of strychnine per pound of carrots that dogs can eat the carcase and not be poisoned?

The Fields Division :—

(1.) 12 lb. carrots or apples finely chopped will take 1 oz. of strychnine finely ground. Sprinkle over this also about ½ lb. white sugar, and allow to soak about four hours. Lay in the evening. (2.) Yes. (3.) Strychnine as a poison affects the whole blood system, and dogs would probably be affected, if not poisoned, by eating the carcases. Phosphorized pollard or grain affects the stomach mainly, and if the entrails are removed from carcases these can be safely given to dogs.

BLUE-GUMS ATTACKED BY WEEVIL-GRUBS.

"SMALL FARMER," Pahiatua :—

There is a beetle here which is killing all my blue-gums. It attacks the young tender leaves as they form at the top of the tree and its branches. At this time of the year (June) this brown, hard, beetle-like insect is hidden under the loose bark of the blue-gums. In the spring and summer months it develops into a green-looking maggot or grub, and it also lives in the tender leaves, with the result that it is killing out all my small blue-gum plantations. Some of the trees that were over 6 in. in diameter are now quite dead. I have three red-gums amongst the others, and so far they have not been affected by the insect; also a few of another small-leaved species of gum are so far quite free from attack, although they are alongside of the affected trees. Can you give me any information on the subject?

The Horticulture Division :—

The weevil the grubs of which are damaging your blue-gum trees is an Australian species that has long been know in New Zealand. The weevil itself does not do much harm, its main business being to perpetuate its kind. Eggs are laid, from which are hatched the grubs that eat the foliage, the grubs later changing to weevils—the perfect insect. Hitherto no cases have come under our notice where gum-trees have been killed by these grubs; disfigurement of the trees has been the only result of their work. It has not been considered necessary or practicable to attempt any treatment of gum-trees. It is probable that the insects give preference to blue-gums because the leaves in a young state are more succulent than those of other species.

LICE ON COWS.

A. Y., Flag Swamp :—

Kindly let me know what is the best cure for cows with lice. Some of mine are very lousy, and yet they are in good condition. I have heard that sulphur mixed in the cows' food is a good cure, but I do not know the quantities to use.

The Live-stock Division :—

Internal treatment is not generally prescribed for lice on cattle, but as affected animals are usually in low condition it is advisable to improve that condition through careful dieting rather than by medicinal treatment. The dose of sulphur for a cow would be from 1 oz. to 2 oz., but when given regularly much smaller doses should be given. A kerosene emulsion, consisting of kerosene 1 part and soap-water 7 parts, can be used as an external application (excepting to the udder), and should be repeated once a week for three weeks. To prevent recontamination the bails, &c., should be whitewashed with a disinfecting solution mixed with the whitewash. Rugs, &c., if used, must also be disinfected.

BLOOD IN HEIFER'S MILK.

H. G. BROWNLEE, Hauraki Plains :—

I have a heifer just calved, and from two quarters she gives down blood with the milk. Kindly advise what is the trouble and the remedy.

The Live-stock Division :—

Blood in the milk is frequently met with in heifers shortly after calving, more especially if they are good milkers. This is easily understood when one considers the alterations, by pressure, &c., of the udder through the production of milk. The result is occasionally a rupture of one or more of the small blood-vessels in the udder. As regards treatment, nature provides this, and in most instances the discoloration disappears after a short time without treatment. Care should be taken that the udder is not unduly agitated while milking. Cold-water applications and wiping dry with a cloth after milking help to reduce the extravasation of blood. Astringent lotions are not required except in persistent cases, as they are liable to reduce the milk-supply. Considering the nature of the herbage at the present time, an aperient drench can also be dispensed with. What is known as a "pea" in the teat (caused through an alteration of the mucous membrane of the teat) also produces blood in the milk under certain conditions.

ROTTING OF TURNIPS.

ALEX. BROWN, Brown's :—

Please inform me why turnips rot in the middle. They are growing on bush land that has been stumped and has had a crop of potatoes taken off it. The turnips have tops 2 ft. high, and are Green-top, Purple-top, and Waite's Eclipse, mixed. A good many of the tops just pull off, and the middle of the turnip is rotten.

The Fields Division :—

The turnips are most probably affected by one or other of the soft-rotting bacteria that often causes the destruction of the interior of the bulbs. No method of control is possible, and early feeding off as soon as any sign of rot appears is the only course to pursue. The appearance of soft-rotting is often primarily due to wet-weather conditions, but at times aphis attack may also lead to bacterial development. This is especially the case when the outside of the bulb is sound, the bacteria having gained entrance through the injured leaves.

HOME-BUTTERMAKING TROUBLES.

N. NIELSON, Riccarton :—

I have been feeding my cows on (bought) mangels and carrots, but the mangels make the butter taste bitter, and the carrots make it very hard. It takes a long time to churn the butter. If you can assist me in the matter I shall be glad.

The Dairy Division :—

Experience has shown that both mangels and carrots are very suitable for feeding to cows. If given along with hay or roughage the flavour of the butter made from the milk will not be detrimentally affected. It is, however, a mistake to feed mangels to cows unless they have first been allowed to stand for some time after being taken from the ground. When fed immediately after lifting, the condition of the roots is likely to seriously affect the digestive organs of the animal.

As regards the difficulty in churning the cream which you mention, this may be due to the temperature of the cream being too low, and if the cows have been in milk a long time and fed on dry feed the particles of butter-fat become hard and do not readily unite in the process of churning. If the cream be heated to a temperature of 176° F. by placing a vessel containing it in boiling water, and stirring the cream and then reducing the temperature to 58° or 60° by transferring the vessel to cold water, the difficulty should be overcome. The cream should be treated in the above manner prior to souring, and then allowed to stand for some time before churning.

TOP-DRESSING FOR PADDOCK.

"SUBSCRIBER," Balfour, Southland :—

I have top-dressed a paddock of mixed grass and clovers with 1 ton per acre of ground limestone. Can you recommend an additional dressing of artificials (give quantity per acre) that might profitably be applied? The land is old river-plain, about 7 in. soil on top of a hard clay and shingle pan, inclined to be wet.

The Fields Division :—

We would recommend the application in August of 2½ cwt. or so per acre of a mixture of superphosphate and either Ephos phosphate, Otago rock phosphate, or any of the island phosphates, in the proportion of 1½ to 1. Heavier dressings than this have been applied in Southland with good results, but as your locality is drier the above should suffice.

Tractor-ploughing at Weraroa Central Development Farm.